Popular Astronomy

Vol. XL, No. 7 AUGUST-SEPTEMBER, 1932 Whole No. 397

The Total Solar Eclipse of August 31, 1932

It would seem that the calendar itself in a subtle way has conspired to attract attention to the coming eclipse of the sun. It is easy to remember the date because of the sequence of the numbers representing the day of the month and the year of the century. This idea, interestingly enough, is emphasized by the fact that a similar mnemonic device was afforded by the calendar in connection with the eclipse which a few years ago attracted so much attention in nearly the same region, namely the one of January 24, 1925. Other similar examples might be mentioned but it would scarcely be profitable to dwell upon circumstances so obviously accidental, however interesting they might be.

So few persons have had the opportunity of witnessing a total eclipse of the sun that the general impression is that eclipses of the sun are phenomena of rare occurrence. On the other hand there is scarcely any one who has reached the age of twenty who has not seen a total eclipse of the moon and consequently to the average person eclipses of the moon seem to be much more frequent events. As a matter of fact the situation is just the reverse. The maximum number of eclipses of both the sun and moon which can occur in a year is seven; of these, five will be of the sun and two of the moon, or four will be of the sun and three of the moon. The minimum number of eclipses to occur in a year is two, and in this case both will be of the sun. In fact solar eclipses are approximately one and one-half times as numerous as lunar eclipses. In order that the reason for this may be understood, it is necessary that one have a clear comprehension of the circumstances which are productive of eclipses.

Although a few simple facts with their consequences are sufficient to explain the phenomena of eclipses, it is certain that every astronomer will be called upon many times to explain what it is that causes an eclipse of the sun or of the moon, whenever and wherever one or the other of these happens to be visible. In a conversation recently the phases of the moon for the next few months were being considered. The new moon phase which occurs on August 31 came under consideration. The remark was made that the occurrence of this phase was the time of the total eclipse of the sun of that date. This elicited the comment, from one who knew that the bright light of the moon made some kinds of astronomical investigation difficult, that fortunately the moon would be out of the way for the eclipse. A few days later the writer was asked where he would spend the summer. He replied that he expected to travel to New England to see the total eclipse of the sun on August

31. Then came the further question, "What is eclipsing the sun now?" In another conversation regarding the eclipse the question as to the time of day of the total phase was raised. When told that it would occur in mid-afternoon, the inquirer replied, "Yes, that's when they generally have them." These instances are mentioned merely to show that although the interest in an eclipse is wide-spread, the comprehension of it is often very vague.

The simple facts referred to above which one must keep before him if he wishes to understand eclipses may be summarized thus:

1. The moon revolves around the earth in a path, called its orbit, which is nearly circular and lies in a plane which passes close to the sun.

2. The light of the moon is not emitted from the moon, as the light of the sun is emitted from the sun, but it is merely light of the sun which has fallen on the moon and is reflected by it to the earth.

3. The earth and the moon are opaque, spherical bodies, and consequently in each case on the side opposite the sun there extends a region of darkness in the form of a cone, which is nothing more or less than the shadow of the body in question.

Let us consider a bit more closely the situation described in the preceding paragraph. These shadow cones are always there and not only at special times, as at the time of an eclipse for instance. The sun is the only source of light which is of sufficient consequence to enter the question here. It is shining continuously and continually illuminating practically one-half of every spherical body in the solar system. The other half is immersed in the base of the shadow-cone just mentioned. Each evening we enter into this shadow and each morning we emerge from it. Or in other words each evening the shadow comes from the east and envelops us, and each morning it recedes from us toward the west and leaves us in the sunlit region once more, marking the beginning of a new day. It is an interesting exercise to contemplate these enormous regions of darkness sweeping majestically and silently through the vast reaches of space, adjusting their positions unerringly to the changing relative positions of the sun and the planets.

Now what are the consequences of these simple facts? First, it follows that the moon in its revolution around the earth will alternately be between the earth and the sun and on the opposite side of the earth from the sun. If the plane of the moon's orbit were so placed as to pass through the sun, the three bodies (sun, earth, and moon) would lie in a straight line at these times. But because of the slight angle between the plane of the moon's orbit and the plane of the earth's orbit, the moon usually passes above or below the line joining the earth and the sun. The sun, however, may be at or near the line of intersection of these two orbit planes, called the line of nodes of the moon's orbit, and at such times the three bodies will lie essentially in a straight line. A little geometric intuition will make this clear. This is the situation which gives

rise to an eclipse of the sun or of the moon. Suppose that the moon is on the opposite side of the earth and on the line joining the center of the earth and the center of the sun. This line, as is readily perceived, is the axis of the shadow cast by the earth. The earth's shadow therefore at such time extends exactly in the direction of the moon. It happens that the earth's diameter is such that the shadow of the earth is of such dimensions that, even though tapering to a point, at the distance of the moon it is still large enough to envelop the moon completely. The moon then for the time being is out of reach of the rays of the sun and, not receiving any light, it cannot reflect any light. The moon then appears dark and is said to be eclipsed. Geometric intuition again will show that there are all gradations from the conditions of total eclipse, just described, through the lessening stages of partial eclipse until the moon again misses the shadow entirely.

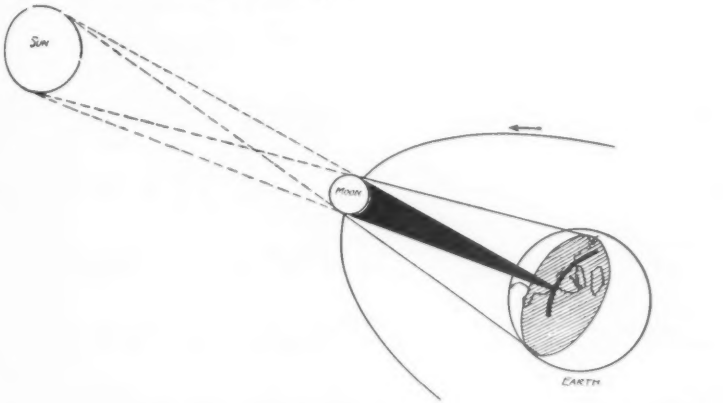

FIGURE 1.

Again, if the three bodies lie on a straight line with the moon between the sun and the earth, a new situation is created. The moon's shadow is then directed toward the earth. But the moon is smaller than the earth, and its shadow at the distance of the earth from the moon is only a comparatively few miles in diameter. Therefore only a small section of the earth's surface will be within the shadow cone at any instant. For the time being no light from the sun falls upon this small region, usually elliptical in form. In other words for an observer within this area the sun is invisible, being completely hidden by the moon. As long as this situation exists the sun is totally eclipsed. But the moon is moving about the earth and the shadow is moving with it, and moreover the earth also is turning on its axis thus bringing a new region into the shadow cone continually. These combined motions cause the elliptical shadow to move swiftly over the earth's surface, and the part traversed

by it during the time when the conditions for an eclipse are present is called the path of the eclipse. The conditions here described, so far as they pertain to an eclipse of the sun, are clearly illustrated in Figure 1, which was furnished by the Warner and Swasey Observatory.

The eclipse of August 31 will receive more consideration than most eclipses because it occurs at a favorable season and in a favorable location. It happens that no extensive astronomical equipment is located in its path but, the region of totality being easy of access, many instruments of various kinds will doubtless be transported thither for the occasion.

The location of the path of totality is clearly and concisely stated in a report by a committee appointed by the American Astronomical Society, consisting of Odin Roberts, R. Meldrum Stewart, and Frederick Slocum, *chairman*, for the purpose of suggesting available sites for and of determining the probable weather conditions at the time of the eclipse. This report was published in the November (1931) issue of POPULAR ASTRONOMY. We quote from it as follows:

"The U. S. Nautical Almanac Office has published a Supplement to the *American Ephemeris*, 1932, entitled Total Eclipse of the Sun, August 31, 1932. In addition to the data necessary for predicting the circumstances of the eclipse for any place, the Supplement contains a map showing the position of the path of totality across the Province of Quebec and New England.

"The northeastern limit of the path passes near La Tuque, P. Q., crosses the St. Lawrence River forty miles west of Quebec, continues over the Rangeley Lakes and strikes the Maine coast at Boothbay.

"The southwestern limit passes through the western suburbs of Montreal, crosses the upper end of Lake Champlain, and passes near St. Albans, Vt., Montpelier, Vt., Concord, N. H., Salem, Mass., and Chatham, Mass., at the heel of Cape Cod.

"The center line of the path of totality passes three miles west of St. Alexis des Monts, crosses the St. Lawrence River ten miles east of Sorel, passes one mile west of Magog, P. Q., three miles east of Island Pond, Vt., one and a half miles east of the summit of Mt. Washington, N. H., two miles west of Fryeburg, Me., and strikes the coast at Cape Porpoise, two miles east of Kennebunk Port, Me."

The accompanying maps (Figures 2 and 3), also taken from the report, will aid in locating the region of totality. For the convenience of those who will be motoring, a number of specially prepared maps have been issued and may be secured by applying to:

New England Hotel Association, 216 Pierce Building, Copley Square, Boston, Mass.

New England Council, Statler Building, Boston, Mass.

Standard Oil Co., 26 Broadway, New York.

Chambers of Commerce of Northeastern Vermont, Newport, Vt.

The New York, New Haven, and Hartford Railroad also has issued an eclipse map.

The width of the path is approximately one hundred miles and the duration at the center of the path approximately one hundred seconds, the duration lessening for locations nearer and nearer the boundaries.

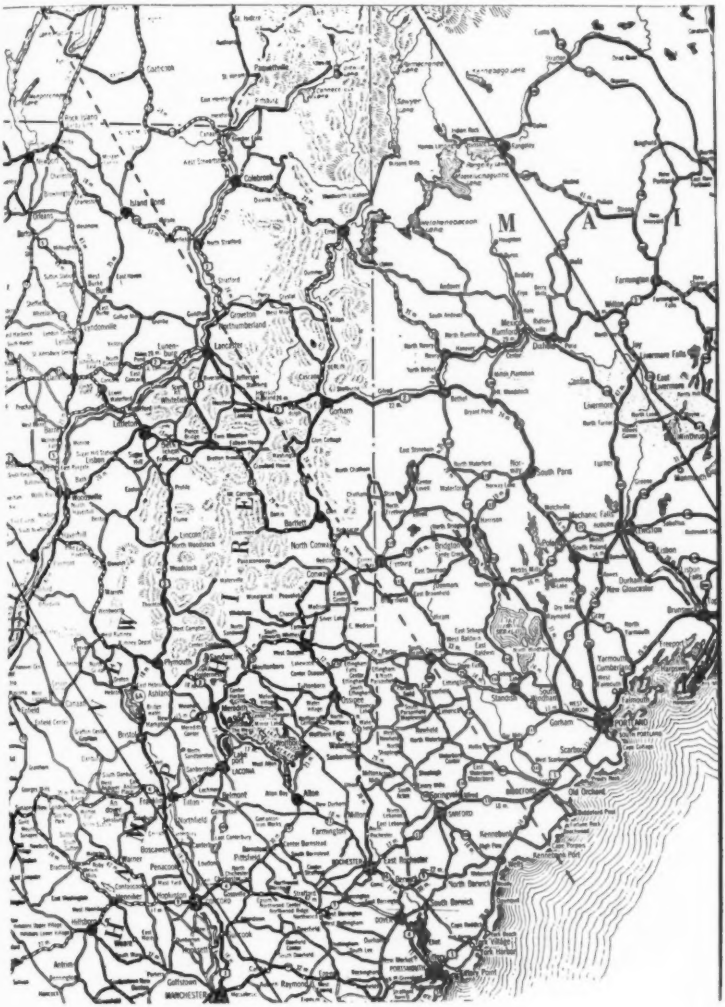

FIGURE 2.

The first question that arises in the mind of anyone who has ever awaited the coming of an eclipse is the probability of a clear sky at the

time. A moment's thought will show that a clouded sky would render futile the most carefully made plans. How impossible it is to foretell the condition of the sky at a given locality and at a given instant of time is well illustrated by the total solar eclipses of 1923 and 1925. As the date of the former, September 10, drew near, many astronomers congregated on Catalina Island off the coast of southern California. This location, the time of year, and the time of day all, it was thought, conspired to furnish ideal conditions for eclipse observers. As a matter of fact at the time of the eclipse the sky was so densely overcast that there was no direct indication as to the part of the sky in which the sun was. On the other hand the eclipse of January 24, 1925, on general

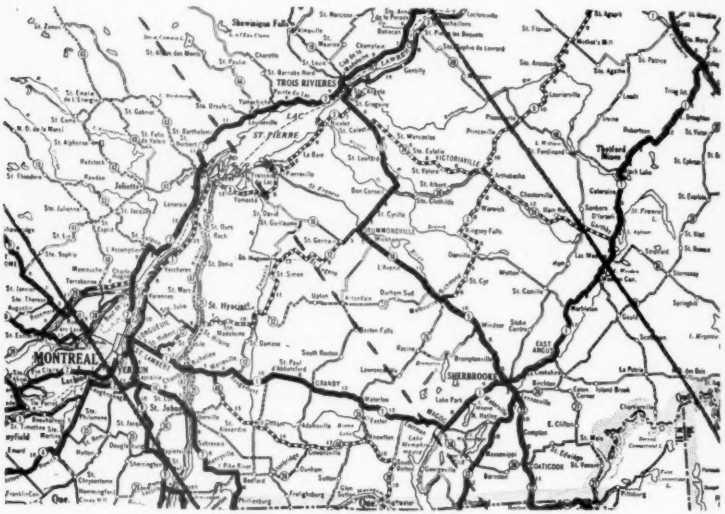

FIGURE 3.

considerations, had little in its favor, occurring as it did in the early morning in midwinter near the Atlantic Seaboard. But those who had the faith and the hardihood to make the necessary effort to observe it were most amply rewarded. Probably a greater number of educated people saw this eclipse than had ever witnessed an eclipse before, and many excellent photographs of it were made.

Observations of weather conditions along the path of totality on August 31 have been systematically made and recorded since 1925, under the direction of the committee of the American Astronomical Society. The conclusion this committee has come to is that the probability of clear sky along the whole path will be about .55, except for the higher peaks of the White Mountains where it will be somewhat less.

The feature of this eclipse, as of every other eclipse, which will be of

the utmost interest to the casual observer, the amateur, and the professional astronomer alike is the very beautiful spectacle of the corona. This faint halo of pearly light surrounding the sun is visible only at the time when the sun is totally eclipsed. Consequently the time for a scientific study of it by the astronomer and the opportunity for the average person for viewing it are very limited. The form of the corona has been found to vary with the stage of the sun-spot cycle. It is more or less uniformly distributed around the sun at the time of sun-spot max-

FIGURE 4.

imum, and extends farther in the direction of the equator than in other directions at the time of sun-spot minimum. This eclipse occurs between these two extremes, possibly nearer the coming minimum phase, and hence the corona is likely to be of an intermediate type.

The two accompanying photographs show the appearance at the eclipse of January 24, 1925. Figure 4, originally published in POPULAR ASTRONOMY, **33**, 176, is from a photograph taken by Professor Frederick Slocum and shows the inner corona and prominences. Figure 5, POPULAR ASTRONOMY, **33**, 224, is of the same eclipse. This photograph

was made at the Vassar College Observatory. The exposure time being longer, it shows the greater extensions of the corona.

Through the generous coöperation of those who are in charge of the eclipse programs at the various observatories which will send expedi-

FIGURE 5.

tions, we have been able to assemble a number of brief, preliminary statements descriptive of the plans now being made. They are given here as they were received. For convenience they are arranged in alphabetical order.

AMATEUR ASTRONOMERS ASSOCIATION

The plans for the organized observations to be made at the approaching solar eclipse by the members of the Amateur Astronomers Associa-

tion are not yet completed. They are in the hands of a small New York Committee composed of Dr. Fisher, Dr. Schlockow, William Henry, and Chas. Elmer, with Mr. L. Mattersdorf, 4861 Broadway, acting as secretary. As soon as prospective participants have registered their names with a statement of their instrumental equipment and their preference concerning the phases upon which they desire to concentrate, an attempt will be made to group them into effective units to observe specified phenomena.

It is realized that the ordinary amateur cannot do specially effective photographic and spectroscopic work, which must necessarily be done by the professional astronomers possessing that elaborate equipment incidental to eclipse expeditions, but there is an enormous amount of work that can be done in a visual way by the experienced amateur, using apertures not smaller than 2 inches nor larger than 4 inches. It is pointed out that a well mounted 2-inch refractor will be found quite serviceable, a 3-inch better, and a 4-inch equatorially mounted will probably be the limit which can be most effectively used in the open. Low power eyepieces are a *sine qua non,* as the image of the sun in the field must be viewed with a large margin to spare, in order to see as much of the corona as possible. The Association recommends that observers work in pairs, one to observe and one to record. The recorder should sit at a bridge table with a clock, accurately adjusted, and note all times called to the second, and then make notes as dictated by the observer from the eyepiece. This method would enable everything seen to be noted and nothing omitted.

The Committee points out that the sequence of the phenomena, which can be observed telescopically, is the moment of first contact when the limb of the sun first appears indented, then the gradual covering of the sun until all that remains is an exceedingly fine crescent at which moment "Baily's Beads" are likely to manifest themselves. These are commended to the careful attention of observers. The Committee further points out the suddenness of the total phase, how the chromosphere springs into view and the exquisitely beautiful prominences then become visible.

The Committee stresses the "boiling" of the sun's limb and how it is liable to cause the chromosphere to present a bubbling appearance which is liable to mislead the inexperienced.

The Association feels that much good work can be done by observing the inner corona. At the 1925 eclipse a curious and unusual phenomenon was observed by one of their members, Mr. Harry Lawton, of New Rochelle, who said that, at the moment the sun started to uncover, his field of view was filled with a nebulous refulgence as if the moon had been dusted with fine talcum powder. The inner corona stood out magnificently showing most beautiful fluting and presenting an appearance which Mr. Lawton describes as if the corona was being ejected radially from the solar surface with a force inadequately expressed, as he says, by the term "the superlative of explosive violence."

For the last contact a high power can be effectively used and the moment the solar limb assumes its normal unbroken contour can be determined by the trained amateur with a high degree of accuracy.

Observers desiring to associate themselves with the A.A.A. group either "solo" or in parties should send their names to Dr. Clyde Fisher at the American Museum of Natural History, New York City.

H. Lawton.

Cincinnati Observatory

We expect to make our headquarters at North Stratford, New Hampshire, about 40 miles north of Mt. Washington. Dr. Elliott Smith and I expect to go early enough to set up our instruments and adjust them, and will be joined later by Mr. Paul Herget, assistant at the Observatory, and Mr. Willard Groene, a voluntary assistant, who recently graduated from our University. As we have no spectroscopic equipment, our work will be limited to studying the structure of the corona. We expect to photograph it with our 10-inch Cooke triplet of 68 inches focal length, using a Wratten K2 filter to cut out the ultra violet; also with a Zeiss triplet of 170 mm aperture and 1200 mm focal length, borrowed from the U. S. Army Air Service. We shall, of course, observe contacts, to obtain the position of the Moon. I have suggested to my friend, Mr. C. W. Frederick, lens expert of the Eastman Kodak Co., that he join us and get a moving picture of the eclipse for educational use.

Everette I. Yowell.

Dearborn Observatory at Fryeburg, Maine

1. Determination of the changes in temperature and pressure of the air in the shadow cone of the moon during the eclipse at definite altitudes. These changes will be recorded every few feet above the ground up to about 50 feet, then at larger intervals by captive balloons and airplanes up to the ceiling for observation planes.

2. Photography of the eclipse spectacle with a battery of motion picture cameras equipped with special lenses and special mounting and equipment.

Associated with the writer in (1) are Mr. C. F. Marvin, Chief of the United States Weather Bureau, who will furnish the aerographs and will direct the decoding of the records; The Honorable Charles Francis Adams, Secretary of the Navy, who has authorized the use of Navy planes from the Boston base; Professor Ernest C. Bryant of Middlebury College, Middlebury, Vermont, who will have charge of the measurements near the ground; Mr. Newton L. Pierce of Dearborn Observatory; and a number of volunteer assistants. Reserve Captain Barnett Harris, Signal Corps United States Army, will prepare for and take the motion pictures.

The expedition is made possible by a liberal grant of money by the Trustees of Northwestern University and the interested coöperation of the persons named above.

Oliver J. Lee.

Drake University

Replying to your letter of June 8, I would say that I am planning to observe the total eclipse at Montreal, Canada. I do not expect to take any equipment except an ocular spectroscope.

In 1927, when I was at Southport, England, I made an agreement with Dr. Comrie, Director of the British Nautical Almanac, to meet him in Montreal in 1932. At Southport, my task was to observe the

duration of totality. I had no knowledge of the computed time for that point, and when I handed the stop watch to Dr. Comrie, I remarked, "This is my observation, but I have no idea how it will compare with your computed time." As he glanced at the watch he remarked, "Why that is precisely the computed time for this spot, that is twenty-two and six-tenths seconds."

My method was to observe the flash spectrum at the beginning and end of totality. I hope I will have some success at the coming eclipse.

D. W. Morehouse.

The Franklin Institute

One of the features of the astronomical section of the new Franklin Institute Museum will be a solar telescope of 85 feet focus, fed with sunlight from a coelostat on the roof. This will give an image of the sun nine inches in diameter in the lobby of the Fels Planetarium. As the optical parts of this equipment, ordered from J. W. Fecker, were to be completed by the summer of 1932, some time before the building will be ready to accommodate it, it was decided to make use of the instrument as an eclipse camera. Through the generosity of Mr. Gustavus Wynne Cook, of Wynnewood, Pennsylvania, funds have been made available to erect this equipment as well as other instruments.

After inspecting several available locations in the path of totality, the writer selected Conway, New Hampshire, for the eclipse station. The local officials at Conway have very kindly made available the building and grounds of the A. Crosby Kennett High School for the purposes of the expedition. The large instruments will be erected on a field adjoining the school and belonging to Mr. Frank E. Kennett. The long-focus camera will be used in a horizontal position, pointing in an eastward direction, and with the coelostat reflecting sunlight into the lens. A long wooden tube will connect the lens with a small shack in which the plateholders will be housed. Plates 20x24 inches in size will be used for direct photography of the corona with exposures varying from 2 to 40 seconds. Parallel to the large tube, and terminating in the same shack, there will be another tube 40 feet long. A lens of this focus, and a coelostat, owned by Mr. Cook and used in his private observatory as a photoheliograph, will be used here to photograph a complete series of the partial phases at five minute intervals, on plates 8 inches square. The shutter of this instrument will be connected with a chronograph and accurate records obtained of the time of each exposure.

Besides the two long-focus cameras there will be a polar axis supporting a number of smaller cameras. These will have focal lengths up to 60 inches and will be used for direct photography, some in color by the Finlay process. Through the coöperation of the Paramount Sound News, a complete motion picture record will be made of the eclipse from first to last contact. The motion picture camera will use a lens of 30 inches focus and will be mounted on a separate pier being fed by a special coelostat. With small cameras an attempt will be made to photograph the shadow bands, if they are visible, both by transmission on a translucent screen and by reflected light, on a white surface on the ground. Photometric measures of the eclipse will also be made using equipment loaned by Professor Charles D. Fawcett of the Moore School

of Electrical Engineering of the University of Pennsylvania. The Franklin Institute expedition will also be the headquarters of the Columbia Broadcasting System. A complete description of the eclipse itself and of the activities of the observers will be broadcast over an international network.

The party will include: Mr. David Auspitz, Philadelphia; Professor W. H. Barton, Director of the Hyatt Observatory of the Pennsylvania Military College; Mr. Charles Bittinger, a prominent artist who will endeavor to paint the eclipse; Mr. Howard Carl, a senior at Lehigh University; Dr. L. J. Comrie, Superintendent of His Majesty's Nautical Almanac, London; Dr. C. H. Gingrich, Editor of POPULAR ASTRONOMY; Mr. I. M. Levitt, a graduate of the class of 1932, Drexel Institute; Mr. Leonard Ormerod, of Philadelphia; Professor George H. Peters, retired astronomer of the U. S. Naval Observatory; Dr. George Rosengarten, of the Philadelphia College of Pharmacy and Science; Mr. H. B. Rumrill, President of the Rittenhouse Astronomical Society; Professor A. C. Schock, of the Central High School, Philadelphia; and the writer. In addition the party will include an announcer and an engineer from the Columbia Broadcasting System, and a cameraman, a sound engineer, and a special technical expert from Paramount Sound News. Probably the motion pictures made from the ground will be supplemented by others made from an airplane. JAMES STOKLEY.

HARVARD COLLEGE OBSERVATORY

Our work will be done with modest equipment.

The corona will be the main object of study—brightness, polarisation; and color, covering spectral regions from ultra-violet to infra-red.

The site, not definitely selected, will be in southwestern Maine.

Staff members in charge: Dr. F. L. Whipple, Mr. L. B. Andrews. Dr. W. M. Cohn, coöperating, is designing and will use the polarimetric apparatus; Mr. W. A. Calder will use a photo-electric cell.

For the Eclipse Committee, WILLARD J. FISHER.

LEANDER MCCORMICK OBSERVATORY

Professor S. A. Mitchell will be in charge of the expedition which will be located near Magog, Quebec, with headquarters at the Hermitage Club. At that place also will be the expedition from Cambridge University under the direction of Professor F. J. M. Stratton. Dr. Minnaert of the University of Utrecht, Holland, will likewise be there.

The 1932 expedition will make Dr. Mitchell's ninth total eclipse. As always in the past, his work will be entirely with the spectroscope. He will have with him the same two spectrographs used with success at the Niuafoou Island eclipse in 1930—namely, two concave gratings without slits. These will be used to photograph the flash spectrum on a fixed plate and also the spectrum of the corona.

THE LICK OBSERVATORY-CROCKER ECLIPSE EXPEDITION

It is a pleasure to announce that Regent William H. Crocker, of the University of California, has generously offered to finance an expedition from the Lick Observatory to observe the total eclipse of the sun that will occur on August 31, 1932. After careful consideration of all avail-

able data, Fryeburg, Maine, was selected as the site for the observing station of the Lick Observatory expedition. At the request of the Editors of POPULAR ASTRONOMY I have prepared the following brief statement concerning the program of observations that we have planned for this eclipse and the instrumental equipment which has been especially designed to secure these observations.

Two photographic telescopes provided with Ross lenses of 5 inches aperture and 15 feet focal length, mounted on a polar axis of rigid design and driven by a synchronous motor, will be used to obtain direct photographs of the corona. These cameras are equipped with magazine plateholders which enable the operator to make exposures in quick succession. In addition a Ross camera of 4 inches aperture and 5 feet focal length will be utilized in studying the corona in light of different colors.

In view of the wealth of information to be obtained from observations of the spectrum of the sun's limb, known as the flash spectrum, our program calls for an intensive study in this particular field. Two moving-plate spectrographs, fed by a coelostat, will give a continuous record of the flash spectrum from the appearance of the lines of lowest level to the disappearance of those of the highest level. These instruments were employed for observations of the flash spectrum at the eclipse of April 28, 1930, and were designed on the principle of the method suggested by Dr. Campbell and successfully used by him at several eclipses. One spectrograph will record the region from H and K to λ 4700 (linear dispersion 3.5 A per mm) and the second spectrograph will photograph the region from Hβ to Hα, with a linear dispersion of 7.5 A per mm. At the same time observations of the flash spectrum will be obtained with two slitless spectrographs which will record on fixed plates the familiar crescent-shaped lines obtained by the usual method of observation. In the first of these instruments the first order of a Michelson grating and a Ross camera lens of 5 feet focal length will be used. The region of spectrum covered by this spectrograph is from K to λ 7000. The second is provided with two prisms of ultra-violet glass and a camera (ultra-violet glass) of 72 inches focal length, and will record the region from λ 3300 to λ 5000. These two spectrographs will be mounted on a polar axis and will be pointed directly at the sun. Both are equipped with electrically operated shutters and special plateholders that permit of obtaining exposures on moving picture film at the rate of one every other second. This will enable us to secure about 75 limb and flash spectra with each instrument.

A third polar axis will carry five spectrographs whose purpose is to record the spectrum of the corona. Three are designed for the determination of the wave-lengths of the emission lines of the inner corona. One of these, provided with an etalon, will be used to obtain an accurate value of the wave-length of the green coronal line. Two spectrographs which were designed for maximum speed will be devoted to a study of the spectrum of the outer corona. It is hoped that these observations will throw further light upon the question of the radial motion of coronal material.

The personnel of the Expedition will consist of Dr. W. W. Campbell,

President Emeritus of the University of California and Director Emeritus of the Lick Observatory, Dr. W. H. Wright, Astronomer, Lick Observatory, Dr. C. D. Shane, Associate Professor of Astronomy, University of California, Dr. D. H. Menzel, Assistant Astronomer, Lick Observatory, Mr. J. F. Chappell, photographer, Lick Observatory, and Dr. J. H. Moore, Astronomer, Lick Observatory, who will be in charge of the Expedition. J. H. MOORE.

UNIVERSITY OF MICHIGAN

The eclipse expedition of the Observatory of the University of Michigan will be located at Fryeburg, Maine. Director Heber D. Curtis will be in charge.

The principal instruments employed will be as follows:

1. Coronal interferometer. This instrument uses large etalon plates 4.8 inches in diameter, and the attempt will be made to secure interference in the green coronal image at 5303 A. This instrument will be run by Curtis.

2. Infra-red flash spectrograph. With this grating spectrograph, to be run by Curtis, the attempt will be made to extend our knowledge of the solar flash spectrum farther into the red with special red-sensitive plates.

3. Two-prism flash spectrograph, in charge of Dr. Dean B. McLaughlin. This instrument will work in the violet and visual regions.

4. Forty-foot camera. Large scale direct photographs will be secured with a lens of forty feet focal length, loaned by Lick Observatory. This camera will be worked by Baldwin Curtis.

5. Special movies of the eclipse will be taken by the staff of the McMath-Hulbert Observatory of the University, Messrs. Robert R. and Francis C. McMath, and Henry S. Hulbert.

Several other members of the Observatory staff are planning to be present on the day of the eclipse. HEBER D. CURTIS.

MOUNT HOLYOKE COLLEGE

The observatory staff and a few members of our Mount Holyoke faculty have accepted the invitation of Mrs. A. E. Nickerson, one of our alumnae, to make her summer home at Loveitt's Heights, South Portland, Maine, our headquarters. This is about 28 miles from the central line, but as we shall take only portable instruments we can decide upon the best place for observation according to the conditions of the day.

We plan to *see* as much as is possible with the unaided eye, field glasses, and small portable telescope. ANNE S. YOUNG.

MOUNT WILSON OBSERVATORY

The Mount Wilson Observatory is planning to locate its eclipse expedition at Lancaster, New Hampshire, in a portion of the track between the White Mountains and the Canadian border. It will, accordingly, serve as a connecing link between the English observers in Canada and the numerous parties from the United States south of the White Mountains and along the border of Maine. The expedition will

occupy a site on Prospect Mountain at an elevation of slightly more than 2,000 feet.

The party will consist of Adams, Babcock, Ellerman, Nicholson, and Pettit. Dunham of the Observatory staff and Dr. F. E. Wright of the Geophysical Laboratory of the Carnegie Institution will join the expedition shortly before the day of the eclipse. Several other astronomers and physicists expect to be present as volunteer observers.

The chief investigations being considered are: measurements of the radiation of the corona with a thermocouple; photography of the spectrum of the corona in the ultra-violet and visual regions with moderate dispersion; and in the infra-red with low dispersion; and photography of the flash spectrum with a moving film spectrograph of the type designed by Dr. Campbell. A spectrograph for observing the spectrum of any prominences present at the time of the eclipse will also form part of the equipment. Direct standardized photographs will be made in ultra-violet and infra-red radiation as well as in ordinary blue light.

All of the spectrographs will be diffraction grating instruments with concave gratings ruled on the large Observatory engine. One 6-inch and two 4-inch gratings will be used with concave speculum mirrors giving parallel light. The linear scale of the spectra will vary from 5.6 to 15 angstroms to the millimeter. Curved films will be used except in the infra-red where short sections of plates of different emulsions will be required.

The solar image will in most cases be formed by concave speculum mirrors fed by plane speculum mirrors on coelostat mountings. Three coelostats will be used, one for direct photography of the corona, a second for spectra of the corona and the third for the spectrum of the flash. In addition a small coelostat will provide light for the spectrograph used in observing prominences.

For the investigation of coronal radiation an equatorial telescope with driving clock has been constructed in the instrument shop. It consists of a concave glass mirror, 20 inches in diameter and 40 inches in focal length, used in combination with a small Newtonian plane. This forms an image of the corona on the receivers of a vacuum thermocouple placed at the focus. A cam provides for shifting the receivers alternately from one side of the corona to the other. Deflections are recorded automatically and the total radiation is measured as well as that transmitted by a cover glass and a water cell. By this method differential values of a high degree of accuracy should be obtained.

WALTER S. ADAMS.

PERKINS AND WARNER AND SWASEY OBSERVATORIES

The Perkins Observatory eclipse expedition will be a joint expedition with that of the Warner and Swasey Observatory of the Case School of Applied Science in Cleveland, and will locate its camp at Douglass Hill, near East Baldwin, Maine.

This location has been made possible through the generosity of Mr. Neal W. Allen of Portland, who kindly offered the Perkins Observatory the facilities of his buildings and land used as a private summer residence.

Dr. Harlan T. Stetson, Director of the Perkins Observatory, will be in general charge of the expedition, the work of the Warner and Swasey Observatory being supervised by Dr. J. J. Nassau, its Director.

The program of the two observatories will supplement each other. The determination of the times of contact and the direct photography of the sun during the eclipse will be undertaken by Dr. Nassau, and radio investigations, with the coöperation of the Perkins Observatory program, will be made by Mr. Sid McCuskey, of the Warner and Swasey Observatory staff. The Perkins Observatory program calls for a continuation of the photometric observations made by Professor Stetson at previous eclipses in connection with numerous Harvard expeditions. Mr. Josef Johnson, Research Assistant at the Perkins Observatory, will operate a Macbeth Illuminometer with the assistance of Mrs. Johnson; and Dr. Edwin F. Carpenter, of the Steward Observatory of the University of Arizona, will supplement the photometric program with photographic recording apparatus for the determination of the intensity of the coronal light and its color index, after the method previously used by King, and employed by Stetson in Sumatra and Malaya. Dr. N. T. Bobrovnikoff, of the Perkins Observatory, with the coöperation of Dr. Brode, of the Chemistry Department of Ohio State University, will undertake spectra observations by means of objective prisms and concave grating.

It is expected that the Perkins Observatory will also be joined by Professor Maynard F. Jordan of the University of Maine, and Professor Manson, of the MacMillan Observatory of Ohio State University.

Mr. William A. Spurr, formally a member of the Harvard expedition to Sumatra in 1926, will go to a remote station in Canada and make photoelectric observations at what will probably be the most northerly point that will be employed for eclipse observations.

The Perkins Observatory plans also include direct photography of the corona in widely different regions of the spectra for a study of the detailed distribution of light intensities with the thermoelectric photometer.

The results of the expedition will be published in future publications of the Perkins Observatory. HARLAN T. STETSON.

SWARTHMORE COLLEGE

We are sending the Swarthmore College Eclipse Expedition from the Sproul Observatory to observe the eclipse of August 31. The party will consist of myself as Director, Professors R. W. Marriott, J. H. Pitman, M. Kovalenko, and W. R. Wright, and Mr. G. Bourdelais. Our program is essentially a photographic one. Our principal instruments are the 63-foot telescope, two 6-inch photographic lenses of 84 inches focal length, several other lenses of shorter focal length, an interferometer, and a spectroscope. We shall mount the 63-foot telescope in a manner similar to that used on previous expeditions. With this we are hoping to secure plates for studying the form of the corona and for making a thorough study of its photographic details. In addition, we hope to secure plates for making a photometric study of the corona.

Professor Wright has built a much more powerful etalon interferometer than we have hitherto used. Mr. W. B. Stearns of Milton, Massachusetts, will be associated with but not a member of the expedition. He will make a number of motion pictures, not only of the eclipse phenomena, but of the erection and operation of the instruments.

JOHN A. MILLER.

UNIVERSITY OF TORONTO

An expedition from the University of Toronto will observe the eclipse at St. Alexis des Monts, a small village about seventy miles north and east of Montreal, and three miles east of the central line. The program will be almost entirely photographic.

Photographs of the corona will be attempted with a lens of aperture 5 inches and focal length 40 feet. Probably four exposures, of varying lengths, will be made. The lens will be mounted at the top of a tower and the plate moved by clockwork, in the manner continually employed by Campbell.

Another camera has a doublet lens of aperture 6 inches and focal length 11 feet. With it probably a single exposure of great length will be made, in the slight hope of recording some stars, although the field about the sun is poor. This camera will be mounted on its own polar axis and driven by a long arm—the well-known method also due to Campbell.

On another axis, driven in the same way, will be: (1) A polarigragh. This is a quadruple camera, giving four pictures on one plate. There are four lenses of aperture 1¼ inches and focal length 42 inches. Over two of them crossed Nicol prisms will be placed and over the other two, suitable filters. During the eclipse the Nicols will be rotated through 90 degrees. (2) A camera with a lens of aperture 1 inch and focal length 34 inches, over which a suitable filter will be placed. (3) A set of nine open tubes with their axes pointed directly towards the sun, and each supplied with a suitable filter. The light from the eclipsed sun will pass down the tube, through the filter to the plate. The plates of all the instruments on this polar axis will be changed simultaneously.

In order to obtain the times of the contacts two motion picture cameras will be geared together so as to run in absolute synchronism. They will be mounted on another polar axis. One camera will take photographs of the sun during the entire eclipse (though of course not continuously) while the other camera will simultaneously take photographs of the face of a chronometer.

An attempt will also be made to secure a record on a motion picture film of the shadow bands. For this purpose a lens of focal length 6 inches and speed f/1.25 will be used. Visual observations of the bands will also be made with white sheets and wooden strips.

Four members of the party will go to the site early in August. The remaining members will follow about August 20. In the motion picture experiments the University has the active coöperation of the Ontario Motion Picture Bureau.

C. A. CHANT.

U. S. NAVAL OBSERVATORY

The following information is furnished you in compliance with your

request:

The U. S. Naval Observatory will send an expedition to observe the total eclipse of the sun on 31 August 1932, if Congress appropriates the funds to defray the expenses. The site which has been tentatively selected is on a flat-topped hill about 700 feet above sea level, on a farm about half way between Limerick, Maine, and Limington. The site selected is approximately one-half mile from the center line of totality.

Captain C. H. J. Keppler, U.S.N., will be in charge of the eclipse expedition. In addition, the personnel will include Senior Astronomer C. B. Watts, Astronomer P. Sollenberger, Associate Astronomers G. M. Raynsford and G. C. Whittaker.

The Observatory plans include:

(1) The astronomical determination of latitude and longitude;
(2) The observation of the times of all the contacts;
(3) Photographs of the inner and middle corona;
(4) Photographs of the extensions of the corona;
(5) Moving pictures of the entire eclipse from first to fourth contacts.

The 65-foot camera will be erected so as to point directly at the sun. The 15-foot camera will be provided with a coelostat, and the smaller cameras will be mounted on a polar axis.

27 June 1932. J. F. Hellweg.

Van Vleck Observatory

The eclipse expedition of the Van Vleck Observatory of Wesleyan University will locate on the farm of Mr. Chester Potter in Center Conway, New Hampshire. The party will be in charge of Frederick Slocum and will include B. W. Sitterly, C. L. Stearns, Lois T. Slocum, N. W. Storer, and others.

The instrumental equipment will consist of a 4-inch lens of 25 feet focal length, two 3-inch lenses of 11 feet focal length, a 6-inch lens of 7 feet focal length, two 8-inch mirrors of 6 and 12 feet focal length, several 3 and 4-inch lenses of short focal length, grating and prism spectrographs.

The program will include photography of the corona in blue, yellow, and red light, and small scale photographs of the flash spectrum and the spectrum of the corona. F. Slocum.

Total Eclipse 1932 August 31

(Revised Data from the Nautical Almanac Office.)

In accordance with the practice of this office, developed during the last few years as a result of the increasing demand by astronomers for the most exact information concerning eclipses, we have recomputed the circumstances of this eclipse.

From 399 of the latest observations of occultations, including some made as late as 20 April 1932 we have obtained a correction of $+5''.3$ to the mean longitude of the Moon taken from Brown's table, and $-0''.8$ to the latitude.

The occultations used were observed at the U. S. Naval Observatory, Georgetown College, Union Observatory of South Africa, Zo-Se, Mt. Holyoke, Wellesley, Weston, Amherst, Wilno, Kiev, Hyderabad, Gene-

va, and London.

Corrections to the ephemeris positions of the Sun were derived from 164 observations made with the 6-inch Meridian Circle of the Naval Observatory January 2-December 30, 1931. The corrections obtained were +1".5 to the Sun's mean longitude, and +0".07 to the latitude. The correction in latitude being so small, it was thought advisable to neglect it.

These corrections were converted into right ascension and declination and applied to the ephemeris positions of the Sun and Moon. The elements were then corrected and the path of totality redetermined.

Corrections of —0.00050 and +0.00017 were found respectively for the values of x and y given in the *Ephemeris*. The other elements were not affected.

The result of the change in the corrections to the Moon's position is a shift of the path of totality westward approximately seven-tenths of a mile.

ADDITIONAL ECLIPSE NOTES

Professor John C. Duncan expects to make visual observations with a 60-mm Zeiss telescope near Fryeburg, Maine.

Professor F. Schlesinger and several other members of the staff of the Yale Observatory are planning to *see* the eclipse, probably in the neighborhood of Fryeburg, Maine.

Professor J. S. Plaskett states that the Dominion Astrophysical Observatory is not planning any observations of the eclipse. He, himself, expects to be in the eclipse path at the time but will not attempt any scientific work.

Professor William H. Pickering makes the following suggestions which may prove to be interesting to some one who happens to have the necessary equipment. "I should like to point out that if anyone furnished with a movie camera should climb a mountain on the afternoon of the eclipse, he might take a series of photographs of the approach and recession of the moon's shadow which would be of interest. The motion of the shadow over mountains and then across extensive level plains to the sea could be well seen from Mt. Pleasant, altitude 2000 feet, near Fryeburg, Maine. I believe this has never been successfully accomplished hitherto. I would also suggest timing the duration of Baily's Beads, *both* near the moon's equator, and near its poles. Not that it is a matter of very great importance, outside of its giving the maximum height of some of the lunar craters on the limb, and near the equator, but simply that I do not recall that it has ever been done."

The Princeton University Observatory is not planning to send out any expedition to observe the eclipse. The astronomers "all hope to *see* it, but quite independently and as individuals."

The Viking Flying Boat Company of New Haven, Connecticut, is holding in readiness two planes which may possibly be of interest to eclipse observers. Each plane can hold a pilot and two passengers with rather ample allowance for camera space. They are planning to take a party of two, with such apparatus, from New Haven to Portland, Maine, before the eclipse and, if necessary, to fly above the clouds (up to 14,000 feet) in case the conditions below are not satisfactory.

The cost of chartering either of these planes is to be $100.00 which will include flying both ways and flying during the eclipse.

Any one interested should write to Mr. F. T. Kurt of the Viking Flying Boat Company of New Haven, Connecticut.

Eclipses of the Sun.—The Columbia University Press announces a third edition of "Eclipses of the Sun" by S. A. Mitchell, director of the Leander McCormick Observatory. The book will be off the press a month before the date of the coming eclipse.

Professor Mitchell's book is too well known to astronomers to need extended notice. However, a portion of a review by the director of one of the great American observatories may be quoted:

"This is a timely work, by an experienced astronomer and an excellent popular writer, which should be of interest to a wide circle of readers. It covers much more than its title would suggest, and is in no small degree a work on modern solar physics. The author has had greater opportunities for observing eclipses than most astronomers, and writes both in a historical way and from personal experience. The book is very fully illustrated and is a contribution to both science and literature."

On account of the enormous increase in knowledge regarding atomic physics since the second edition was printed eight years ago, it has been necessary to rewrite entirely the chapters dealing with the chromosphere, corona, and the problem of relativity. The third edition is, therefore, practically a new book with a new method of presenting eclipse problems.

Total Eclipse viewed by Television.—Some months ago the question of bringing the total eclipse of the sun of August 31 to people outside of the path of totality by means of television was investigated. That it was not an idle speculation is shown by the newspaper clipping which follows.

> "Just to prove that it could be done, Orestes H. Caldwell, former member of the United States Radio Commission and now editor of Electronics, arranged a *real television broadcast* of a *"make believe" eclipse*. This was picked up *four miles away* and viewed on a television screen by a large audience of amateur astronomers at the American Museum of Natural History. A Telechron motor, such as is used to operate electric clocks, wound a fine black thread around a spool and pulled the model "moon" across the face of the model "sun" while the television scanner recorded the action."

We have recently learned from Mr. Caldwell that because of the expense involved it is not likely that the project will be carried out. He says, "While the television of an eclipse is perfectly possible within the limits of television's present definition, it does not appear that the eclipse will be televised this year."

The Coming Total Solar Eclipse

By WILLIAM H. PICKERING

Since this eclipse is coming near the middle of the vacation season, and near the center of the holiday region of the most populous portion of the United States, it is likely to be the most observed eclipse that has ever occurred in the western hemisphere. Such being the case, it is presumable that there will be many amateur as well as professional astronomers located along the line of totality. Along the well established lines of research the professionals will have the finest instruments obtainable in the country. For those who do not belong to these parties their only hope of doing anything of any use whatever in the astronomical line is to do something different. Every amateur photographer will want to take a picture of the corona himself, showing all the detail possible. Since the diameter of the Moon in inches will be one one-hundredth of the length of focus of the lens, the amateur can easily see how large his picture will be before hand. Doubtless thousands of feet of kodak film will be wasted. At previous eclipses a considerable amount of time has also been wasted in careful preparations to observe the shadow bands. This phenomenon is now fully understood as due to ripples in the terrestrial atmosphere, it has nothing to do with astronomy, and is of no interest whatever except merely as a spectacle.

Perhaps the *only* matter that has not already been pretty thoroughly exhausted at previous eclipses is a study of the location of the extreme outer boundary of the corona, and of the brightness of the sky outside of that. This was investigated in a preliminary way at the eclipse of 1886, observed in Grenada, B.W.I. Two cameras were used, one of 4 inches aperture, 24.5 inches focus, with a ratio of 1 to 6, and the other of 2.6 inches aperture, 8.5 inches focus, ratio 3.3. Both were furnished with Dallmeyer portrait lenses absorbing a considerable fraction of the actinic rays. Both were mounted equatorially, a board serving as the polar axle. The cameras were screwed onto it at the proper declination. The board was prolonged by metal bearings working in a wooden framework, and driven through gearing by a crank which was revolved once a second by hand, the assistant controlling the speed by a metronome close by. Another assistant counted the seconds aloud, and saw to it that the metronome did not stop. Seed 21 plates were used, which at present would be considered of only moderate speed. The investigation is described in full with illustrations in *Harvard Annals*, **18**, 85. If anyone wishes to establsh a record, it is I believe a fact that no one has ever yet succeeded in showing any detail on the face of the Moon during a total solar eclipse. The Moon is at that time brightly illumined by the full Earth, just as it is at the time of new moon, only more so, yet

we know that next to the corona, the most striking feature of the eclipse is the intense blackness of the Moon as compared to the dark blue of the surrounding sky. There seems to be no hope of seeing any detail, but it can undoubtedly be photographed with a large enough rapid lens, and a suitable exposure of perhaps eighty seconds. Judged by the results of the eclipse of 1886 the focus of the lens should not be less than 24 inches, and a backed moderately rapid plate should be used.

Our results were based on photographic photometry, the unit of light being that of a lamp burning Colza oil, derived from cabbages. This was permitted to shine through a hole in a brass plate one millimeter in radius, and at a distance of one meter, for one second. The intrinsic brightness of the brightest part of the corona was found to be 0.031 units, that of the surrounding sky at a distance of 10° to 15°, 0.0007, and the brightness of Earthlight on the Moon, Oceanus Procellarum, one day before the first quarter, 0.000015. This last result was based on two plates taken on February 18, 1888, with the Boyden 13-inch telescope. As seen from the Moon the Earth would be one day before the last quarter, and if it were full it would have been intrinsically about six times as bright, or one-eighth the brightness of the sky at the time of the eclipsed Sun. This last observation is described on page 75 of the same volume.

By knowing the exact place where Polaris should appear, in line with the tops of two posts, and watching for it with the naked eye, it was found night after night to be first visible surprisingly closely at the same number of minutes after sunset. Three minutes later judged by the stars visible in the zenith, or perhaps more accurately speaking by those which were not visible, the sky was of the same brightness as at the time of the total eclipse.

With the larger camera, and an exposure of two seconds, at the time of the eclipse, the corona extended on the average to a distance of 15′ from the Moon's limb, but there was no darkening due to the sky. With an exposure of eight seconds the maximum and minimum extent of the corona were 1°.6 and 1°.0, the sky showing very faintly just beyond it, but farther out was not visible. With the smaller camera and an exposure of 40 seconds the sky showed faintly but clearly, over half the plate. An exposure of 100 seconds or even more would doubtless have been better. There were numerous clouds which affected our result somewhat. We had purposely erected a pole with cross slats upon it which came into the field of view, and which showed distinctly against the sky.

In order to obtain quantitative results a series of squares of standard exposures, each being twice that of its predecessor should be impressed on the plate before its exposure to the sky. It would be rather more accurate to have the squares all exposed for the same interval, but through apertures of different sizes. These preliminary exposures which should be made on one end of the plate, as well as those to the

sky, should be made through a sheet of perforated brass, such as is used for strainers, and can be obtained at any hardware shop. The brass should be in contact with the film, and the holes in the metal should be about a millimeter in diameter. The exposure to the sky must not of course be allowed to overlap the standard squares, which should be shielded from it during the exposure by a narrow strip of black paper. Another plate of squares taken through the perforated brass, and similarly exposed to the standard light, or to the Oceanus Procellarum on the full moon (see POPULAR ASTRONOMY, 1923, **31**, 393) will serve to make quantitative comparisons of the different regions. The brightness of Procellarum at full moon is 1.2 units. That is to say its intrinsic brightness photographically is 1.2 times that of the flame of a lamp burning Colza oil. For intrinsic brilliancies, which are what we want to measure in this case, or for the nebulae or comets, Colza oil which can be obtained of uniform quality, and can be burned in an ordinary lamp, makes a convenient and excellent secondary standard. Traquillitatis, which is a trifle darker although smaller than Procellarum, would perhaps make a better primary. It would be less affected by slight differences of phase than the former, being somewhat nearer the center of the disk. For our present purpose their brilliancies are practically identical. The brightness of the brighter regions of the Moon as a whole is only 1.8 times as great as that of the darker maria. On the last two plates above described the Moon appeared brighter than the sky, because these plates had not been backed. The sky was brighter to the east and west of the Sun than to the north and south, possibly due to the zodiacal light. If so, it is the first and perhaps only time that it has been photographed at the time of a total eclipse.

It is sometimes said that the brightness of the sky during totality is due to light reflected from the Earth's surface outside of the Moon's shadow. In that case it should be distinctly yellowish. In point of fact it is obviously bluish. The light that comes to us from the black surface of the Moon is due to this source plus reflected Earthlight, but the light from the sky just outside the corona is eight times as bright as this, and can only be derived from Sunlight reflected from matter more distant than the Moon. In fact it comes chiefly from matter more distant than the Sun, and comparatively near it, that is from matter near the full phase, not the crescent. A total eclipse is in short our only opportunity to measure the brightness of the lower portions of the zodiacal light, and we find as above stated that it is about 0.0007 photographic units. It is about one hundred times as bright as the night sky surrounding the full moon, and 1/17700 as bright as Procellarum at full.

PRIVATE OBSERVATORY, MANDEVILLE, JAMAICA, B. W. I., APRIL 23, 1932.

Total Solar Eclipse of August 31, 1932

By JAMES ROBERTSON

(Communicated by Captain J. F. Hellweg, U. S. Navy, Superintendent.)

After the eclipse of August 31, 1932, there will be four total solar eclipses visible in the United States during the remainder of this century.

The first of these, that of August 9, 1945, will be visible as a partial eclipse in the northwestern part of the United States. The umbra, first touches the earth in western Idaho and moving rapidly in a northeasterly direction will leave our borders in less than seven minutes. The second, that of June 30, 1954, will also be visible as a partial eclipse throughout the western part of the United States. The umbra, first touches the earth in northern Nebraska and moving rapidly in a northeasterly direction will leave our borders in less than four minutes. At the beginning of an eclipse the Sun is in the horizon and the Moon's shadow being tangent to the Earth moves along its surface very rapidly during the first few minutes. Owing to these conditions neither of these two eclipses will be much of a spectacle, comparatively speaking.

The third, that of March 7, 1970, will be visible as a partial eclipse throughout the southern part of the United States. The umbra after crossing Mexico and the Gulf of Mexico will pass over Central Florida, in an easterly direction and at a time when the Sun is near the meridian. For these reasons Florida will be favorably located for making observations and also for the general public to view a beautiful and impressive spectacle. But 1970 is a long way in the future and only the comparatively young among us will have an opportunity to view this eclipse. The fourth and last will occur on February 26, 1979, and will be visible as a partial eclipse throughout the northern States. The umbra, reaching the State of Washington from the Pacific Ocean, at a time when the Sun is near the meridian and traveling east for over a thousand miles before leaving our borders, will thus again offer a fine opportunity for making observations and for viewing a beautiful spectacle, but you will have nine years longer still to wait.

In view of the above information, it would seem that the best opportunity to view a total eclipse of the Sun for us will be that of August 31, 1932. This eclipse will be visible as a partial eclipse, with varying degrees of obscuration throughout North America. The path of totality will take a very unusual course. Beginning just north of Siberia it will cross the Arctic Ocean, passing near the North Pole, and will enter British America north of Hudson's Bay. Continuing on its curve in a southeasterly direction it will cross Canada and New England with a width great enough to encompass the northern boundaries of both

Vermont and New Hampshire, and will leave our shores between Salem, Massachusetts, and Booth Bay, Maine, to end in the middle of the Atlantic Ocean.

From north of the Saint Lawrence River to the Atlantic Ocean the country passed over is very picturesque and contains many delightful places to spend a short time during the late summer and early fall, even if there were not the added attraction of a total eclipse of the Sun to observe. This entire region is very accessible, being traversed by many railroads and covered with a network of automobile roads. It is dotted with hotels and summer resorts for the accommodation of tourists. These conditions should form an added inducement for everybody who can, to take advantage of this opportunity to view an eclipse of the Sun.

To those who have never observed a total solar eclipse we might add that it will offer one of nature's most beautiful and impressive spectacles. There is nothing that will bring to us quite so vividly the capacity and accomplishments of the human intellect as the actual observation of such a phenomenon. It will recall to us that man has determined the constants of the solar system, including the size, shape, and mass of the bodies composing it to a marvelous degree of accuracy. That he has even determined the minute deviations in the motions of these bodies in their respective orbits caused by their gravitational effects on each other. For if he could not predetermine all these quantities, neither the time of the eclipse nor its path on the surface of the earth could be so accurately predicted.

On Accurate and Speedy Adjustment of Coronagraphs for Totality of August 31, 1932

By DAVID TODD

Many circumstances conspire to make useful any method of accurate and speedy adjustment of instruments for photographing the coming totality. Geographically the path of totality is most favorably located. Good roads are everywhere, and hundreds of stations are likely to be occupied with a multitude of observers and instruments. Cloud interference, however, is everywhere to be expected—chances about 50-50, as indicated by observations at 70 to 100 stations, 1925 to 1931, already discussed by Dr. Frederick Slocum, and published in POPULAR ASTRONOMY (November, 1931).

The object of the present paper is to indicate a method of instrument adjustment, accurately and in a minimum of time. Indeed, a single observation is sufficient, if the observer arrives late at his station and is lucky to have clear skies for the day and night preceding totality. I first

employed the method in Russia for totality of August 8/21, 1914, and reported on it in *Nature* for October 29, 1914, page 232. The method was further amplified in my paper in POPULAR ASTRONOMY, for May, 1927 (Vol. XXXV, No. 345).

Five elements are necessary:

(1) Exact focal length (photographic) of the objective.
(2) Approximate longitude of station. Map-longitude converted into time will suffice.
(3) Hour angle of the Sun's center at mid-totality.
(4) A corrected chronometer, preferably sidereal.
(5) A list of several lucid stars whose declination is nearly the same as that of the Sun at mid-totality ($+8° 31'$). Their right ascensions should be several hours greater or less than that of the Sun ($10^h 39^m$).

For the approaching eclipse, a single first-magnitude star is most helpfully located (α Aquilae, Altair), its declination ($+8° 41'$) being only one-third the Sun's diameter north of the center of the eclipsed Sun.

I have, however, selected from the *American Ephemeris* all lucid stars of nearly the same declination as the Sun at total eclipse. Unfortunately none of the bright planets is suitably placed for this occasion. The complete star list follows:

Catalog Number	Name of Star	Mag.	Right Ascension h m	North Declination ° ′
104	o Piscium	4.5	1 42	8 49
130	ξ^1 Ceti	4.5	2 9	8 32
143	ξ^2 Ceti	4.3	2 25	8 9
201	o Tauri	3.8	3 21	8 47
255	μ Tauri	4.3	4 12	8 43
340	ϕ^1 Orionis	4.5	5 31	9 27
365	Betelgeux	0.8	5 51	7 24
453	β Can. Min.	3.1	7 23	8 25
503	β Cancri	3.8	8 13	9 24
612	π Leonis	4.9	9 57	8 22
677	χ Leonis	4.7	11 2	7 42
730	o Virginis	4.2	12 2	9 7
770	ρ Virginis	4.9	12 38	10 37
1034	κ Ophiuchi	3.4	16 54	9 29
1105	72 Ophiuchi	3.7	18 4	9 33
1218	α Aquilae (Altair)	0.9	19 47	8 41
1345	ϵ Pegasi	2.5	21 41	9 34
1441	55 Pegasi	4.7	23 4	9 2
1447	59 Pegasi	5.1	23 8	8 21

Also the N or S limb of the Moon may be available on July 8 and 23; also August 4 and 20.

At the instant when the corrected chronometer time shows that the star's hour angle is the same as that of the sun at mid-totality, fix the plate holder securely in its final position, the star being on the median line through the center of the plate. Make allowance for the difference between the star's declination and that of the Sun at mid-totality. Thus

a single observation provides accurate adjustment of the plate-holder, in both right ascension and declination.

To make the position-angle adjustment of the plate-holder slide, insert a clear glass plate or film with a dark E and W line finely drawn upon it. By watching 10 or 15 minutes earlier, twist the slide till the star trails along this line or exactly parallel to it. Then collimate (1) the center of the objective on the center of the plate-holder, and (2) the center of the plate-holder on the center of the objective. Lastly, verify the focal plane.

CAMP BARTA, CASCO, MAINE, MAY 17, 1932.

Syracuse Meeting of Section D (Astronomy) A. A. A. S. 21 June 1932

By **PHILIP FOX**, *Secretary*

The pre-occupation of astronomers with preparations for observation of the eclipse of August 31 and for the meeting of the International Astronomical Union which follows immediately thereafter made the attendance at Syracuse small but still at each of the two sessions there was an attendance of about thirty. There were sixteen titles on the program, distributed with rather unusual balance, with ten on problems of the solar system, two instrumental, and only four on stellar problems. As no representative of the Mount Wilson Observatory was in attendance, the papers from that institution were distributed among eastern astronomers for presentation. In the absence of the Vice-President, Professors S. L. Boothroyd and W. S. Eichelberger presided.

The first paper on instruments was a description of The New Ball-bearing Support System for the 100-inch Mirror by F. G. Pease. The distortion of the mirror from friction on the supporting disks has been overcome by ball-thrust bearings placed between the disks actually in contact with the mirror and the supporting plates. The system has been in use for a year. The star images have been round except during times of rapid temperature changes.

R. C. Williams in his paper on Deposition of Chromium on Glass for Reflectors, described a method wherein a tungsten wire heavily electroplated with chromium is used as a hot filament in a vacuum. The chromium evaporates off and forms a hard opaque deposit on the reflector which is enclosed in the vacuum chamber. The chromium surface reflects 60% at λ 4250, 70% at λ 3400, and 60% at λ 2900. The process and the product may be of great value to astronomy.

There were six papers dealing directly with the Sun. S. B. Nicholson made a study of Sun-spots and the Weather. He finds no definite correlation between the number of sun-spots and seasonal rainfalls of Sacramento and San Francisco. The mean annual temperatures of six

tropical stations were compared with the sun-spot curve. The correlation coefficient is —0.37, which, though low, is probably real. (Investigators in this field must eventually realize that no results of value can be expected until the scope of investigation of terrestrial response is world-wide. Nothing can be expected from consideration of data from a few stations.) Nicholson and Miss Elizabeth E. Sternberg in The Present Phase of the Solar Cycle estimate that the sun-spot minimum will occur between 1933.6 and 1934.8, probability favoring the earlier date. The date of minimum is important in view of the approaching eclipse and the coronal form to be expected. Frederick Slocum in his address on Solar Coronal Problems discussed coronal form, structure, and motion. He pointed out that the spottedness of the Sun on the eclipse day and more especially near the limb was of more significance in determination of form than the mere stage in the solar cycle. Ross Gunn discussed the forces and motions imposed on the ions of the Sun's atmosphere by magnetic and electric fields and their influence in solar phenomena. His calculations indicate that the magnetic and electric forces far exceed those of gravity and radiation pressure and that these forces should determine the stability and provide the mechanism for the support of the corona. He suggests that the Sun's atmosphere rotates more rapidly than the Sun proper and urges that observations of the rotation of the upper chromosphere and corona be included in eclipse programs.

Investigations of band spectra are becoming increasingly valuable agents for interpretation of solar and stellar surface conditions. The strongest bands of the hydrocarbon molecule are at λ 4300, λ 3900, λ 3143. The first is found conspicuously in the Sun and the stars of class G0 and later. While the other bands have not been observed in stellar spectra, R. S. Richardson finds evidence of them in the solar spectrum. Moreover, from the study of the distribution of intensity in the P branch of the λ 4300 band, he determines the temperature gradient in the reversing layer. The determination is based on the fact that if the temperature of an emitting gas layer is not homogeneous the intensities of the band lines show for the higher rotational energy levels a higher temperature than for the lower ones. Therefore if the depth is known the difference between the temperature for the higher and lower rotational quantum numbers should give the temperature gradient in the gas layer. A temperature of $4410° \pm 249°$ K was found for the lower quantum numbers and $6020° \pm 432°$ K for the higher. Assuming a depth of 125 km the temperature gradient is about 13° per km. Also he found the relative pressure in sun-spots and reversing layer, using a formula based upon the theory of band line intensities and the equation of dissociation equilibrium for molecules, to be 0.48.

R. W. Shaw identifies members of the OH bands at λ 3064 and λ 3428 in the solar spectrum in large numbers, with close correspondence in relative intensities to those of the laboratory. For the band

λ 3428 the identification rests entirely on the members of the R branch, every member of which is identified. A study of the intensities of the lines in this band gives the solar temperature at 5100° C.

W. S. Adams and Theodore Dunham contributed a very interesting paper on Absorption Bands in the Infra-red Spectrum of Venus. In the region λ 7400 to λ 8900 occur the telluric bands due to oxygen (the A band) and water vapor (region λ 8200). Though the scale was large, 5.6 A.U. per mm, and the planetary radial velocity adequate to separate the corresponding lines in the atmosphere of Venus if present, no such lines were detected. However, three bands not present in the solar spectrum, with heads at λ 7820.2, λ 7882.9, and λ 8688.7 and all degraded toward the red, were detected. Measurements of the separations and considerations of moment of inertia indicate that the bands may be due to carbon dioxide.

C. H. Smiley's paper, "Empirical Laws of Planetary Distances," was read by title.

C. C. Wylie estimates that about 17 meteorites strike in the United States per year, that about 1/30 of these fall in villages and cities. While the urban population is denser and chance of observation therefore greater, the city noises and illumination are offsetting factors which balance the count in city and country.

S. L. Boothroyd in a paper on the important work of the Arizona Meteor Expedition reported that over 10,000 meteors had been observed with naked eye through reticles. Twenty-nine hours of telescopic observing yielded 396 meteors, of which 2/3 were seen in six hours on a mountain station, elevation 10,300 feet. The greater transparency of the higher altitude yields a large increase. This has been amply borne out by later observations. Velocities of 200 to 300 km/sec for the telescopic meteors seem to be the rule rather than the exception.

R. E. Wilson contributed a paper on the Taurus cluster increasing the membership of 136 by adding 221 and expanding the spread of it from diameter 18 to 250 parsecs. He calls the additional stars "group stars." He finds that the distributions of spectra in the cluster and group stars are similar.

In a paper on Elimination of Coma Effect from Observed Stellar Wave-lengths, Sebastian Albrecht dealt with one of the causes of troublesome spurious displacements of lines of the spectrum which arise within the optical system of the spectrograph and presented tables for corrections.

Two papers on stellar spectroscopy closed the program. R. F. Sanford presented accumulated evidence for the presence of the carbon isotope C_{13} in stars of classes R and N. Heads of the primary bands and the related secondary bands of $C_{12}C_{12}$ were measured at λ 4737.02 and λ 4715.52, of $C_{12}C_{13}$ at λ 4744.66 and λ 4722.90, of $C_{13}C_{13}$ at λ 4752.27 and λ 4730.23. The growth of the bands was shown in a sequence of three class R and four class N stars.

The final paper by Paul W. Merrill gave evidence of presence of the Green Auroral Line in Novae. The green line λ 5577, a forbidden line of neutral oxygen, has a simple relationship to the oxygen lines at λ 6300 and λ 6363, which are found in the gaseous nebulae. There is an analagous relationship for the doubly ionized oxygen lines, λ 4363 and the nebular pair λ 4959 and λ 5007. A third group exists in the singly ionized nitrogen line λ 5755 and the pair λ 6548 and λ 6583. λ 5755 is more intense in novae than in nebulae. The evidence indicates that λ 5577 of the novae is identical with the green line of the aurora and that the pressure in the emitting shells of novae is between that of the nebulae and the tenuous auroral strata of the Earth's atmosphere.

Planet Notes for September and October, 1932

By CLIFFORD E. SMITH

The *Sun* will be moving southeast from the central part of Leo to the eastern part of Virgo. On September 23, at $0^h\ 16^m$ C.S.T., the sun will cross the celestial equator which marks the beginning of fall. The distance from the earth to the sun at the beginning of this period will be about 93.7 million miles, and this distance will decrease about 1.5 million miles by the end of October. The position of the sun on September 1, October 1, and October 31 will be, respectively: R.A. $10^h\ 40^m$, Decl. $+8°\ 27'$; R.A. $12^h\ 28^m$, Decl. $-3°\ 1'$; and R.A. $14^h\ 20^m$, Decl. $-13°\ 59'$.

The phenomena of the *Moon* will occur as follows:

First Quarter	Sept.	7	at 7	A.M.	C.S.T.
Full Moon		14	" 3	P.M.	"
Last Quarter		22	" 7	P.M.	"
New Moon		29	" 11	A.M.	"
First Quarter	Oct.	6	" 2	P.M.	"
Full Moon		14	" 7	A.M.	"
Last Quarter		22	" 11	A.M.	"
New Moon		29	" 9	A.M.	"
Perigee	Sept.	3	" 1	P.M.	"
"	Oct.	1	" 11	A.M.	"
"		29	" 8	P.M.	"
Apogee	Sept.	19	" 10	A.M.	"
"	Oct.	16	" 12	P.M.	"

On September 14 there will be a partial eclipse of the moon. "Invisible at Washington; the beginning visible generally in Europe, Africa, the eastern part of the Atlantic Ocean, the Indian Ocean, Asia, and Australia; the ending visible generally in the northeastern part of North America, the Atlantic Ocean, Europe, Africa, western Asia, and the Indian Ocean."*

Mercury will be moving with an apparent southeasterly motion from western Leo, across Virgo, to the central part of Libra. Early in September it will be a morning star rising about an hour before the sun, but by the end of October it will be an evening star setting about an hour after the sun. Superior conjunction will occur on September 29. On September 3 Mercury will be at greatest elonga-

**American Ephemeris and Nautical Almanac*, 571, 1932.

tion west (18° 4′). On September 13 it will be in conjunction with Jupiter (Mercury ⅜° N), and on October 30 with the moon (Mercury 3° N). The distance of Mercury from the earth will increase from about 80 million miles to about 130 million miles on October 7, and this latter distance will have decreased about 15 million miles by the end of October. The corresponding change in apparent diameter will be from about 7¾ to 4¾ and back to 5¼ seconds of arc.

Venus will be a brilliant morning star, rising about three hours before the sun. Its apparent motion will be from eastern Gemini, across Cancer, to eastern Leo. Its distance from the earth will be about 60 million miles at the beginning of September, and this distance will increase about 40 million miles during this period. At the beginning of this period its apparent diameter will be about 26 seconds of arc, and at the end of this period about 15 seconds of arc. On September 7 Venus will be at greatest elongation west (45° 58′). Conjunction with the moon will occur on September 26 and October 26 (Venus 3½° S and 2° N, respectively). On October 15 Venus will be in conjunction with Neptune (Venus 13′ S), and on October 20 it will be in conjunction with Jupiter (Venus 7′ S).

Mars will be moving with an apparent southeasterly direction from the central part of Gemini, across Cancer, to the western part of Leo. It will be a morning star rising about four hours before the sun. Its distance from the earth will decrease from about 185 million miles to about 145 million miles. Its apparent diameter at the end of this period will be about 6 seconds of arc. Conjunction with the moon will occur on September 25 and on October 24 (Mars 2¾° S and 1° S, respectively).

Jupiter will continue in Leo. During September it will be near the sun in apparent position, but preceding it, since conjunction with the sun occurred late in August. During the middle of this period its distance from the sun will be about 580 million miles, and its apparent diameter will be about 30 seconds of arc. At the end of this period it will rise about three hours and a half before the sun. Conjunction with Mercury and Venus have been mentioned. Conjunction with the moon will occur on September 26 and on October 26 (Jupiter 21′ N and 1° N, respectively).

Saturn will continue in western Capricornus, and during the middle of this period it will cross the meridian about seven hours after the sun. Its distance from the earth during the middle of this period will be about 890 million miles, and its apparent diameter will be about 15 seconds of arc. Quadrature east of the sun will occur on October 22. Conjunction with the moon will occur on September 10 and on October 7 (Saturn 3½° N on each occasion).

Uranus will be above the horizon most of the evening hours during this period in Pisces, since opposition with the sun will occur on October 14. Its distance from the earth will be about 1770 million miles and its apparent diameter will be about 3½ seconds of arc. Conjunction with the moon will occur on September 17 and on October 14 (Uranus 4° S on each occasion).

Neptune will be in Leo, and, during the first part of this period, it will be near the sun in apparent position since conjunction with the sun occurred on August 31. By the end of October, however, it will rise about four hours before the sun. A conjunction with the moon will occur on October 25 (Neptune 13′ N).

OCCULTATIONS

OCCULTATIONS VISIBLE IN LONGITUDE +72° 30′, LATITUDE +42° 30′.
(Contributed by the office of the *American Ephemeris*.)

Date 1932		Star	Mag.	IMMERSION Greenwich C.T. h m	IMMERSION *a* m	IMMERSION *b* m	IMMERSION Angle E from N °	EMERSION Greenwich C.T. h m	EMERSION *a* m	EMERSION *b* m	EMERSION Angle E from N °
Sept.	13	42 Aqr	5.5	4 59.2	—1.0	+0.6	43	6 12.8	—1.1	—0.2	240
	15	60 B.Psc	6.0	10 10.9	—0.4	—1.8	98	10 59.5	0.0	+1.0	203
	20	18 Tau	5.6	11 5.9	—1.7	+0.5	55	12 19.6	—1.0	—2.0	282
	22	354 B.Tau	6.4	4 33.4	+0.1	+1.8	66	5 36.2	—0.6	+1.4	266
	24	47 Gem	5.6	4 48.4	..	..	12	4 59.8	..	..	348
	24	134 B.Gem	6.5	6 55.0	—0.1	+2.1	67	7 57.0	—1.1	+0.4	297
Oct.	16	μ Ari	5.7	11 33.6	—0.3	—0.7	67	12 33.2	+0.2	—1.2	266
	19	38 B.Aur	6.5	4 30.4	—0.7	+2.1	65	5 47.3	—1.5	+1.2	262
	19	47 B.Aur	6.0	7 51.1	—2.0	+2.2	52	9 8.4	—2.1	—2.0	295
	20	406 B.Tau	5.6	0 59.9	+0.9	+1.5	53	1 45.9	+0.1	+0.8	291
	23	γ Cnc	4.7	5 34.7	+0.4	+3.0	53	6 14.7	—1.0	—1.1	332
	24	8 Leo	5.9	6 32.7	—0.1	+1.5	88	7 30.9	—0.7	0.0	311
	31	τ Sco	2.8	21 31.4	—1.4	—1.5	120	22 31.4	—0.6	—0.8	246
		OCCULTATIONS VISIBLE IN LONGITUDE +91°, LATITUDE +40°.									
Sept.	13	42 Aqr	5.5	4 39.5	—0.6	+2.0	12	5 43.1	—2.5	—0.5	270
	15	60 B.Psc	6.0	10 0.2	—1.2	—1.6	94	10 54.3	—0.2	+1.4	199
	18	20 H³.Ari	6.4	11 47.3	—1.2	+2.0	22	12 41.0	—0.8	—2.8	290
	20	18 Tau	5.6	10 28.0	—2.0	+1.2	59	11 56.9	—2.0	—0.8	265
	22	354 B.Tau	6.4	4 36.5	+0.7	+1.9	46	5 25.2	—0.3	+0.8	288
	24	134 B.Gem	6.5	6 54.5	+0.7	+2.4	47	7 38.1	—0.8	—0.1	314
Oct.	9	27 Cap	6.1	0 52.5	..	..	129	1 20.3	..	..	170
	10	ι Aqr	4.4	6 11.4	—0.7	—0.2	58	7 17.2	—0.3	—0.1	233
	16	μ Ari	5.7	11 26.7	—0.7	—1.3	88	12 33.5	—0.5	—0.4	240
	19	38 B.Aur	6.5	4 20.8	+0.3	+2.4	42	5 18.8	—1.1	+0.8	284
	19	47 B.Aur	6.0	7 17.0	—1.0	+3.2	41	8 28.4	—2.5	—0.8	292
	23	γ Cnc	4.7	5 44.2	..	..	26	5 59.2	..	..	355
	26	83 Leo	6.3	11 7.9	—0.9	+0.7	106	12 10.6	—0.8	—0.8	323
	31	τ Sco	2.8	21 3.1	—1.8	—0.9	116	22 14.8	—1.5	—0.7	259
		OCCULTATIONS VISIBLE IN LONGITUDE +120°, LATITUDE +36°.									
Sept.	15	60 B.Psc	6.0	9 12.6	—1.8	+0.8	59	10 32.7	—1.1	+1.1	218
	18	20 H³.Ari	6.4	11 2.7	—0.7	+4.0	8	12 2.2	—3.0	—2.0	283
	20	q Tau	4.3	9 16.5	—2.9	—0.1	112	10 11.2	—0.1	+4.2	192
	20	18 Tau	5.6	9 36.7	—0.5	+3.3	27	10 47.6	—2.6	+0.1	277
	20	21 Tau	5.8	9 45.9	—3.1	—0.3	111	10 44.6	—0.5	+4.2	194
	20	22 Tau	6.5	9 58.4	..	..	128	10 37.2	..	..	179
	23	49 Aur	5.1	13 56.1	—2.4	—0.5	103	15 30.3	—2.3	—0.8	275
Oct.	10	ι Aqr	4.4	5 46.5	—0.4	+2.0	12	6 49.3	—2.3	—0.9	268
	16	μ Ari	5.7	10 48.9	—2.3	—1.7	104	12 0.0	—1.6	+2.0	210
	19	354 B.Tau	6.4	13 51.6	—1.1	—3.1	134	14 55.7	—2.0	+0.4	235
	21	47 Gem	5.6	13 40.6	—2.3	—0.5	95	15 6.5	—1.4	—2.2	304
	26	83 Leo	6.3	10 56.1	0.0	0.0	125	11 52.2	—0.3	+0.4	291
	26	τ Leo	5.2	11 29.1	—0.2	0.0	126	12 27.7	—0.5	+0.4	293
	31	τ Sco	2.8	20 20.9	—0.8	—0.9	150	21 17.7	—2.5	+0.9	245

The quantities in the columns *a* and *b* are given for the purpose of making these predictions useful for any place within 200 miles of the point indicated. The procedure is as follows: Subtract the longitude of the point given from the longitude of the place in question; multiply the result, taking the signs into account, by the quantity under *a* for the star to be observed; similarly, with the latitude, using *b*; apply the sum of the products, with its proper sign, to the

Greenwich C.T., and obtain the predicted Greenwich Civil Time for the phenomenon at the place of observation. To obtain Eastern Standard Time it is necessary to subtract five hours; Central Standard Time, six hours, etc.

Meteor Notes from the American Meteor Society

By CHARLES P. OLIVIER, President

In this paper we are able to continue the publication of rates by our observers for 1932, thus practically keeping these up to date. Further we add a table containing more of the radiants deduced from the 1931 observations. These are now being rapidly worked up.

In this connection, some of our observers will be disappointed when eventually they see no radiants or at most very few credited to them. This will be due to two main causes. First, many observers have never taken the trouble to learn the constellations well enough to plot with any accuracy. Until they learn the stars well enough so that they can turn from sky to map and quickly put their fingers upon the stars desired, their plotting will not yield good radiants. Everyone has to begin plotting, it is true, and none need expect to do it well at first. Most observers need considerable practice before they can properly reproduce upon the star charts what they see in the sky. Second, some observers have the habit of observing very often, but cutting their observing periods to an hour or less. Unless they have exceptional luck or a real shower is going on, they cannot hope to obtain radiants from this procedure. The writer has often tried to point out that a person who works for four hours on one good night is doing far more useful observing than one who works on eight nights for periods of an hour or less. Of course frequent observing familiarizes one with the constellations and the working procedure, but unless the period is prolonged to at least two hours, results of value where radiants are concerned will be few and far between. Even for rates, a period of less than one hour is quite useless except during the August and November showers.

The writer has had the great pleasure of receiving a second Australian meteorite through the kindness of one of our members, R. S. Shinkfield of Adelaide. This is an iron, weighing about a pound, which was one of those collected from the rims of the remarkable group of meteor craters discovered in the central part of Australia.

A number of specimens of supposed meteorites from various parts of the United States have been submitted of late, but none appears authentic. Some were superficially like meteorites, but a microscopic examination proved them otherwise.

A.M.S. Bulletin, Number 13, which contains a revised and complete questionnaire for fireball observations, prepared particularly for non-members and the casual observer, is now ready for distribution. Large numbers are being sent to the heads of our regional groups.

With regard to the Eta Aquarids (the Halley Comet meteors), observations now at hand from other members prove that few were seen in this country except by J. D. Williams at Tucson, Arizona. His success was due to very long, unbroken, observing periods and splendid atmospheric conditions, which continued for most of the nights when these meteors were expected. We hope some of our members in the Southern Hemisphere had equally good fortune. Of course it is

now 22 years since the comet passed perihelion, and unless the debris is equally distributed, which is unlikely, we might expect fewer meteors than were seen nearer 1910.

DAVID F. BRINEGAR, TUCSON, ARIZONA.

1932	Began	Ended	Total	Meteors	F.	Rate	Cor.Rate	Remarks
April 30	10:00	12:00	120	13	1.0	6.5	6.5	
May 1	10:00	12:00	120	14	0.9	7.0	7.8	
6	12:00	13:00	60	16	0.9	16.0	17.8	
10	11:45	13:15	90	17	1.0	11.3	11.3	
28	9:00	11:00	120	16	1.0	8.0	8.0	3 others seen
31	12:28	13:28	60	14	1.0	14.0	14.0	

FRANKLIN W. SMITH, GLENOLDEN, PENNSYLVANIA.

May 2	13:20	15:45	145	4	1.0	1.6	1.6	
13	14:47	15:37	50	5	1.0	6.0	6.0	
14	13:15	15:30	135	8	1.0	3.6	3.6	Moon first 30^m
22	9:55	10:40	45	1	1.0	1.3	1.3	
26	9:15	10:45	90	2	1.0	1.3	1.3	
29	12:40	15:10	150	14	1.0	5.6	5.6	
June 2	13:00	13:45	45	3	1.0	4.0	4.0	
7	12:20	14:50	150	8	1.0	3.2	3.2	
9	9:25	11:40	135	4	1.0?	1.8	1.8	Moon 6 days old

SALLY URQUHART, DETROIT, MICHIGAN.

April 23	8:34	11:15	154	8	1.0	3.1	3.1	At Manchester,
30	13:59	15:04	65	2	1.0	1.8	1.8	" " Mich.
May 14	13:20	14:18	58	2	0.7	2.1	3.0	" "
	15:09	16:05	56	6	1.0	6.4	6.4	" " Dawn approaching at end
23	10:31	11:50	79	7	1.0	5.3	5.3	
28	10:20	12:30	130	15	1.0	6.9	6.9	Jay Lake, Mich.
29	10:45	12:05	140	4	1.0?	1.7	1.7?	" " Bright aurora

GORDON RIDLEY, ALAMEDA, CALIFORNIA.

Jan. 2	12:50	14:40	110	9	0.7	5.0	7.1
May 3	15:50	16:30	40	5	0.3	7.5	...
4	14:45	16:00	75	8	0.4	6.4	...
June 7	10:56	12:16	80	12	1.0	9.0	9.0
8	10:27	11:47	80	9	1.0	6.8	6.8

MISSOURI GROUP.

FLETCHER HICKERSON, WEBSTER GROVES, MISSOURI.

Mar. 24	8:15	9:15	60	0	0.8	0.0	...
27	8:54	9:24	30	1	0.8	2.0	2.5
28	8:16	8:56	40	0	1.0	0.0	...
29	15:30	16:00	30	1	0.8	2.0	2.5
31	8:27	9:10	43	2	0.7	2.8	4.0
April 1	7:56	9:30	94	3	0.8	1.9	2.4
2	8:45	10:05	74	1	0.8	0.8	1.0
4	8:21	9:06	45	0	0.7	0.0	...

WESLEY SIMPSON, WEBSTER GROVES, MISSOURI.

Mar. 28	8:26	8:56	30	0	1.0	0.0	...
29	15:30	16:00	30	0	0.8	0.0	...
April 1	9:00	9:30	30	1	0.7	2.0	2.9
2	9:25	10:05	40	0	0.8	0.0	...
12	9:06	10:06	60	4	0.8	4.0	5.0
May 2	14:00	16:00	120	8	0.8	4.0	5.0
4	9:40	10:10	30	0	1.0	0.0	...
14	14:40	15:30	50	6	0.8	7.2	9.0
29	10:45	12:00	70	5	1.0	4.3	4.3

HENRY C. CROW, GRAND TOWER, ILLINOIS.

1932				Meteors
April	21	....	..	4
	22	....	..	7
	23	....	..	7

RADIANTS.

A.M.S. No.	Date 1931		α °	δ °	Meteors	Wt.	Remarks
2608	May	10.6	191	+64	1	Good	Stationary
2609	June	8.6	170	+68	4	Poor	
2610		9.c	252	+65	5-6	Fair	
2611		9.6	276	— 9	4	Fair	1040?
2612		9.6	277	+56	5	Good	
2613		10.6	244	—16	3	Fair	
2614	June	19.7	306.0	+48.5	3	Good	
2615	July	16.8	306.3	+39.5	7	Good	
2616	Aug.	10.8	40.5	+54.2	3	Good	Telescopic Perseids only, worked out by C. B. Ford
2617		10.8	45.9	+56.2	7	Good	Perseids
2618		12.7	44.5	+52.1	7-8	Good	Perseids
2619		13.8	55	+52	10	Fair	Perseids
2620		15.7	10	+52.5	2-5	Fair	48?,550
2621		15.7	51	+59.5	2	Poor	Perseids
2622	May	23.8	289.5	+27.0	11	Good	1464
2623		23.8	316.6	+22.7	3	Good	Including one remarkable stationary meteor
2624	June	5.7	236	+17.5	3	Fair	1 more on June 1

Radiant Nos. 2608-2613 by C. Abernathy, Clearwater, Florida.
2614-2615 by H. A. Burns, Spring Valley, New York.
2616-2621 by C. B. Ford, Ann Arbor, Michigan.
2622-2624 by L. LaPaz, Columbus, Ohio.

1932 June 21, Flower Observatory, Upper Darby, Pennsylvania.

Some Lost Meteorites

By C. C. WYLIE

THE PLYMOUTH IRON. About the year 1872, Mr. John J. Kyser, a farmer living five miles southwest of the town of Plymouth in Marshall County, Indiana, found in one of his fields a mass of iron. This mass was four feet long, three feet wide and six or eight inches thick. It was an annoyance in plowing the field, so after a year or two he, with his son, dug a deep hole beside it, into which the iron was pushed and buried one and one half to two feet below the surface of the ground. In 1883 a smaller piece twelve and one-half inches long, seven and three-eighths inches wide, two inches thick and weighing six pounds was found. This was given to Mr. W. S. Adams. In 1893 it was discovered that this was meteoric, and Wards' Natural Science Establishment secured it. Search was then made for the larger iron mass by John M. Kyser, the son of the elder Mr. Kyser, and then city clerk of Plymouth. Mr. Ward came in person and assisted in the search. Trenches were dug and a surveyor's needle was used in the attempt to locate the big mass, but without success.

Recently we received from Dr. W. J. Fisher of Harvard a letter suggesting that it might be worthwhile to renew the search for this mass of meteoric iron. We wrote to the Magnetic Division of the U. S. Coast and Geodetic Survey, and

received the reply that in the opinion of that department, if the iron were really as big as reported, it could probably be located with the modern sensitive needles. Professor R. B. Abbott of Purdue University, Lafayette, Indiana, and Mr. Shirl Herr of Crawfordsville, Indiana, are now renewing the search with a sensitive magnetic balance.

An Anonymous Stone. In the year 1892 a stone meteorite weighing fifty pounds fell in one of the southern states and was recovered immediately after its fall. A university professor, interested in meteorites as a side line, learned of this fall through a former student and purchased the stone. Because of threatened litigation the meteorite was not announced at the time, but was briefly referred to in an article published thirteen years later. After the death of the professor, the stone passed into the possession of a son, on whom we called in 1929. As the meteorite appeared to be genuine, we requested the privilege of studying it and publishing the facts of its fall. The present owner seemed ready to consent, and promised to look up the records on the fall of the stone and on any possible study that might have been made by his father. Our letters to him since that date, have, however, not been answered. Presumably he is busy with his affairs and has, merely because of lack of interest, neglected to give the matter of his father's meteorite any attention. It is possible that this stone will be lost to science, and it is quite certain that the available information will be much less than would have been the case had the facts been promptly made available to scientists interested in meteoric falls.

At Tilden. At the time of the fall near Tilden, Illinois, on July 13, 1927, our first investigations indicated that, if the area of the meteoric field was as large as is often the case, small meteoric stones might be found in the vicinity of Sparta, Illinois. Sparta was about six miles back along the path of the meteor from Tilden. However, on our first visit to Sparta we obtained no reports of the finding of meteoric stones. Some days later a local pharmacist reported that a small stone, which he considered unquestionably genuine, had been brought to him for inspection. He had examined the larger meteorites found near Tilden, with a magnifying glass, and had tested fragments with certain reagents in his laboratory. The smaller stone was unquestionably of the same material. It had been found by Mr. Ed. Minner, the local photographer, while raking his lawn. It weighed only a few ounces and was lying on the lawn as though it had been tossed there. Mr. Minner had given the stone to his little granddaughter to play with, and it had been lost. A few weeks after our visit he sent a letter reporting that he had not been able to locate the stone, and a short time later he retired from business, moving from Sparta. A letter addressed to him after that date was unanswered, and it is reasonable to assume that the small stone lost by the child will never be found.

At Paragould. First investigations of the fall near Paragould, Arkansas, in the morning hours of April 17, 1930, showed that the meteor had come from the northeast. Consequently we spent some days driving over the area to the northeast of the place where the two large metorites had been recovered. Several reports of supposed meteoric stones were investigated. One proved to be a piece of iron pyrites, bearing a good general resemblance to the meteorites. Another stone was simply a piece of granite. In a third case a farmer reported that he had found a hole, perhaps two feet deep with clods of dirt scattered around it; the hole being similar to those made by the meteorites. He had looked into it, and seeing nothing, filled it up. We advised him to remove the earth and make

sure. He did this, but nothing was found. Someone else had removed the meteorite, without the farmer's knowledge, or, more probably, the hole was not made by a meteoric stone. Perhaps a dog had been digging out something which he had chased into a hole.

At another farm we found that, on the morning of the fall, the farmer had noticed a hole in the path between his house and barn. The hole was perhaps five inches deep, and in the bottom a dark object could be seen resembling, as he said, a frog. A day or two later on hearing of the big meteorites, he dug out this stone, which he was certain must have fallen at the same time. He allowed us to take it into Paragould where we made an examination sufficient to convince ourselves that the stone was a genuine meteorite. The owner would not, however, part with it permanently. A little later, when we again approached him, we found he had sold the stone, and we were unable to learn the name of the party to whom it had been sold. It appeared that it was lost; but we have since learned the name of the purchaser, and the location of the third Paragould stone is, therefore, now known.

The Hurst Stone. Mr. Noah Hurst told in 1927 the following story of the incident: The stone was found in the woods near the home of his father, John Hurst, which was located between De Soto and Hurst, three and one-half miles east of De Soto and close to Hurst. The stone was found probably in the year 1898, and in the summer, as the trees were green at the time. The family did not see or hear it fall, but their attention was attracted in the morning when they noticed the tree across the road, from the farm house, with the top torn out. Two good-sized branches were broken off and dirt was thrown about fifteen feet. The leaves on the broken branches were still green and the dirt had obviously been freshly thrown. This stone weighed perhaps two hundred pounds and was of a reddish, copperish color, with black specks. It was rather heavy and hard and did not crumble. From the appearance of the freshly thrown dirt and the tree limbs when found it must have fallen within the past day. Only the top of the stone was showing when it was found nearly buried in the hole. Mr. Hurst took the stone out and removed it to the yard of his home. It was still lying in the yard when the family moved away about 1900 or 1901. Mr. John Hurst moved to California, his address in 1927 being 520 Hathaway Avenue, Monteroy Park, California.

As Noah Hurst was only about ten years old at the time, his memory of details, such as the weight and color of the stone, might well be inaccurate; but the broken branches and the freshly thrown dirt made it appear probable that the incident was really a meteoric fall. This part of the story was verified by an uncle of Noah Hurst living in the same village. We therefore arranged with him for a drive back to the old home near Hurst, a distance of about fifty miles. On arrival, we found that the old home had been torn down and the farm buildings razed many years earlier, leaving nothing but a field last planted in wheat. Interviews with neighbors who had been acquainted with the Hursts failed to elicit any information as to what had been done with stones moved away when the home was torn down. We stayed over night in the community, but left the following morning, as it appeared there was little possibility of ever locating the stone which, according to the report, must have fallen through the tree.

Near Sparta, Illinois. The following story was told by some elderly residents of the community. About fifty years ago, on the morning following the appearance of a brilliant meteor, searchers found a freshly made hole some two

or three feet deep with a stone at the bottom. The owner of the land, however, an eccentric individual, filled the hole. When approached again for permission to dig up the stone, he plowed the field, making any future search almost impossible.

IN CONCLUSION. Some of the preceding stories almost certainly refer to genuine meteorites. For others, as the last, the evidence is not so good, but they undoubtedly illustrate ways in which meteorites are lost after having attracted at least local attention.

University of Iowa, July 2, 1932.

A Brilliant Meteor.—A brilliant meteor was observed here in the early morning of June 5 at approximately 12:35 A.M., E.S.T. As I was facing in the opposite direction I did not see the meteor itself which illuminated the surrounding country considerably more than does the full moon. A bright train, about ½ degree in width and about 10 degrees long remained visible for more than ten minutes. Rho Cygni was squarely in the center of the train which also passed exactly midway between π_1 and π_2 in Cygnus. There was no perceptible drift to the train.

L. C. PELTIER.

Delphos, Ohio, June 13, 1932.

A Bright Meteor.—On the morning of June 21—at 12:03 A.M. to be exact—I happened to look up at the sky and saw an exceedingly bright meteor. I was with my friend A. V. Goddard at the time and we were just through for the evening, looking through his telescopes. The meteor in question must have appeared just before I saw it and moved very rapidly a few degrees in a southwesterly direction. It developed rapidly from a weak, red color into a splendid ball of an intense blue white color, all within less than two seconds. The meteor faded out as suddenly as it had appeared and left behind traces of red glowing matter that disappeared within a second of time. By pointing the 16-inch telescope at the spot where the object vanished we obtained the following data: R.A. 21^h13; Decl. $+57°30$.

ARTHUR JOHNSON.

282 E. 49th St. N., Portland, Oregon, June 23, 1932.

Variable Stars

Monthly Report of the American Association of Variable Star Observers for May and June, 1932

We welcome observations from three new observers, Dr. C. L. Hess of Bay City, Michigan; Sidney Rochlin of Tucson, Arizona; Weston College, Weston, Massachusetts, as well as the return to active ranks of F. H. Chandler of Belgrade Lakes, Maine. Dr. Hess has succeeded in gathering together several promising observers in his neighborhood. Creating such centers of activity as in Bay City, Tucson, and Forth Worth, Texas, certainly bespeaks well for the future of the Association.

This report is one of the largest bimonthly reports which has been contributed for several years. More than 50 observers have taken part, more than 400 variables have been under observation, and more than 4700 observations are included herewith.

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

April 0 = J.D. 2426798; May 0 = J.D. 2426828; June 0 = J.D. 2426859.

J.D.Est.Obs.

V SCL

000339

784[11.6 Bl

S SCL

001032

784[12.0 Bl

T AND

001726

867 12.4 Pt

T CAS

001755

779 7.5 Ch
798 6.9 Th
799 7.4 Jo
801 7.2 Ah
802 7.7 Mn
802 7.0 Jo
804 7.2 L
807 7.5 Mn
808 7.4 Ah
810 7.4 Jo
814 7.4 Jo
821 7.2 Pt
822 7.5 Jo
824 7.8 Mc
827 7.5 Ah
828 8.6 Mc
829 8.5 Mc
830 7.8 Mn
831 8.5 Mc
836 7.9 Th
841 7.9 Th
842 7.7 L
850 7.9 Jo
851 8.8 Mc
855 8.9 Mc
855 8.3 Ah
856 8.8 Mc
858 8.0 Jo
861 8.0 Jo
862 9.1 Mc
863 8.2 Jo
867 8.2 Pt

R AND

001838

779 7.4 Ch
801 8.0 Ko
827 8.9 Ko
843 9.7 Ko
867 10.7 Pt
869 10.8 GD

S TUC

001862

770 10.2 En
772 10.9 Ht
773 10.6 Bl
780 11.0 Ht
784 10.8 Bl
791 11.0 Bl

S TUC

001862

804 13.0 Bl
826[12.4 Bl

T PHE

002546

773 13.3 En
784[12.2 Bl

Y CEP

003179

793 11.3 Ch

U CAS

004047a

804 13.1 L
842 13.3 L

V AND

004435

842 12.0 L

X SCL

004435

784 10.5 Bl
791 10.4 Bl

RV CAS

004746a

867[13.2 Pt

— CAS

004746b

867 10.8 Pt

W CAS

004958

799 8.7 Jo
800 8.8 Ko
801 8.9 Ko
801 9.2 Ah
802 8.7 Jo
808 9.3 Ah
810 9.2 Jo
814 8.8 Jo
819 8.8 Jo
821 9.1 Pt
822 9.3 Jo
827 9.5 Ah
827 8.8 Ko
830 9.5 Jo
843 9.7 Ko
850 9.7 Jo
855 9.7 Ah
861 9.9 Jo
863 9.7 Jo
867 10.2 Pt
868 9.8 Pc

U TUC

005475

770 12.7 En
772 12.4 Ht

U TUC

005475

780 13.1 Ht
784 13.3 Bl
785 13.3 Sl
791 13.3 Bl
805 13.8 Sl
806[12.9 Ht
812[12.9 Ht
828[12.9 Ht

U SCL

010630

784 9.9 Bl
791 10.1 Bl

U AND

010940

844 13.0 L

S CAS

011272

793 10.5 Ch
800 10.7 Ko
801 10.7 Ko
802 10.8 Jo
820 11.0 Jo
820 11.1 Ko
821 11.8 Pt
824 11.3 Ko
843 11.9 Ko
867 12.1 Pt

RZ PER

012350

804 12.5 L
844 13.6 L

RU AND

013238

804 10.9 L
842 10.6 L
867 11.1 Pt

Y AND

013338

804 12.4 L
867[13.0 Pt

X CAS

014958

802 12.5 Jo
821 12.0 Pt
858 12.3 Jo
863 12.5 Jo
867 12.5 Pt

U PER

015254

802 11.3 Ry
805 11.4 Ry
810 11.4 Ry
820 10.0 Jo
821 10.7 Pt
822 10.9 Ry
824 10.8 Ry
824 10.0 Mc

U PER

015254

828 10.3 Ry
829 10.0 Mc
830 10.1 Ry
831 9.9 Mc
833 10.1 Ry
843 9.8 Ry
862 9.3 Mc
867 9.3 Pt

R ARI

021024

776 10.3 Ch

W AND

021143a

867 9.7 Pt

T PER

021258

740 9.1 Hr
801 8.9 Ah
802 8.6 Jo
821 8.7 Pt
822 8.6 Jo
867 8.7 Pt

Z CEP

021281

821 11.3 Pt
858 12.0 Mc
867 12.9 Pt

o CET

021403

770 5.8 En
773 5.6 En
783 5.0 Ch
795 3.7 Sl
802 3.6 Sl

S PER

021558

801 9.7 Ah
802 9.2 Jo
813 9.3 Sz
821 9.7 Pt
822 9.4 Jo
867 9.6 Pt

RR PER

022150

867[13.0 Pt

R FOR

022426

784 8.0 Bl
791 8.1 Bl
804 8.4 Bl
817 8.3 Bl
826 8.4 Bl

RR CEP

022980

867[12.5 Pt

R TRI

023133

776 6.4 Ch
799 6.8 Jo
867 8.6 Pt

T ARI

024217

800 8.7 Ko
801 8.7 Ko

W PER

024356

776 9.5 Ch
799 8.8 Jo
800 9.1 Ko
801 9.0 Ko
802 8.7 Jo
802 9.1 Ry
805 9.1 Ry
810 9.0 Ry
812 9.0 Ko
813 9.3 Cy
814 8.8 Jo
817 8.9 Ko
819 8.8 Jo
820 9.3 Cy
821 8.9 Pt
822 9.1 Jo
822 9.0 Ry
824 9.0 Ry
824 9.3 Mc
825 9.0 Ko
828 9.4 Mc
828 9.0 Ry
829 9.3 Mc
829 9.1 Hl
830 9.0 Ry
830 9.2 Jo
830 9.3 Cy
831 9.2 Mc
833 9.0 Ry
843 9.0 Ry
843 8.7 Ko
851 9.3 Mc
855 9.4 Mc
861 9.0 Jo
862 9.1 Mc
863 8.9 Jo
867 8.5 Pt

R HOR

025050

771 11.2 En
772 11.5 Ht
773 11.0 Bl
778 11.0 En
780 11.3 Ht
784 10.3 Bl
786 11.1 Ht
791 10.2 Bl
794 10.6 En

R HOR

025050

799 10.3 En
799 10.5 Ht
804 9.8 En
804 9.6 Bl
805 8.7 Sl
806 9.8 Ht
812 9.0 Ht
817 8.5 Bl
823 8.4 Ht
826 7.6 Bl
828 7.9 Ht

T HOR

025751

771 8.3 En
772 8.3 Ht
773 7.9 Bl
778 8.8 En
780 9.1 Ht
784 8.5 Bl
786 9.1 Ht
791 9.1 Bl
794 9.5 En
799 9.3 En
799 9.7 Ht
804 10.2 En
804 9.7 Bl
805 9.9 Sl
806 10.1 Ht
812 10.7 Ht
817 10.5 Bl
825 11.1 Ht
826 11.1 Bl

ρ PER

025938

803 3.7 We

U ARI

030514

776[13.1 Ch

X CET

031401

776 11.4 Ch

Y PER

032043

776 8.2 Ch
799 8.2 Jo
800 8.0 Ko
801 7.8 Ko
801 8.9 Ah
802 8.0 Jo
805 8.4 Ko
811 8.3 Ko
815 8.2 Ko
817 8.0 Ko
819 8.0 Jo
821 8.4 Pt
822 8.1 Jo
867 9.0 Pt

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
R PER	X CAM	R PIC	S PIC	T COL	T ORI
032335	043274	*044349*	*050848*	*051533*	*053005a*
776 12.4 Ch	806 8.9 L	778 7.7 En	771 8.0 En	799 7.6 En	810 10.4 L
804 11.4 L	820 8.2 B	780 7.6 Ht	772 7.8 Ht	799 7.0 Ht	812 10.7 L
821 9.2 Pt	820 8.2 Me	784 7.3 Bl	774 8.3 Bl	804 7.6 En	812 10.6 Pt
U ERI	821 8.6 Pt	786 7.3 Ht	778 7.8 En	804 7.5 Bl	816 10.7 Pt
034625	825 8.5 Me	791 7.6 Bl	780 7.8 Ht	806 7.0 Ht	817 11.0 Ch
771[12.6 En	825 7.9 L	794 7.2 En	785 8.0 Bl	812 7.3 Ht	819 10.8 Pt
794[12.3 En	828 8.0 My	799 7.3 En	786 7.8 Ht	817 7.4 Bl	821 10.7 Pt
T ERI	832 7.9 Sn	799 7.4 Ht	791 8.3 Bl	823 7.8 Ht	826 10.6 Pt
035124	836 8.0 Ch	804 7.2 En	794 7.5 En	826 7.6 Bl	S CAM
771 11.3 En	838 7.9 L	806 7.2 Ht	799 8.1 En	828 7.8 Ht	053068
778 11.9 En	839 8.3 Me	812 7.3 Ht	799 7.8 Ht	S AUR	778 9.5 Ch
794 12.2 En	849 8.3 Me	823 7.5 Ht	804 8.5 En	052034	817 9.5 Jo
799 12.2 En	851 8.0 Pt	828 7.6 Ht	804 8.2 Bl	776 11.2 Ch	820 9.1 Jo
T TAU	868 9.5 Me	V TAU	806 8.3 Ht	785 11.3 Ch	821 10.0 Pt
041619	R DOR	044617	812 8.6 Ht	793 11.3 Ch	825 9.3 Jo
737 10.5 Hr	*043562*	776 9.9 Ch	817 8.4 Bl	799 11.0 Jo	835 9.5 Sn
744 10.4 Hr	771 5.3 En	801 9.5 Ch	823 8.7 Ht	800 10.9 Ch	845 9.3 Jo
R TAU	772 5.5 Ht	802 9.7 Jo	826 8.7 Bl	800 11.3 Ko	852 9.6 Jo
042209	773 5.9 Bl	826 10.4 Pt	828 9.1 Ht	801 11.2 Ko	858 9.4 Jo
776 13.3 Ch	778 5.6 En	R ORI	R AUR	804 11.0 Ch	863 9.6 Jo
801 12.3 Ch	780 5.4 Ht	045307	050953	806 10.0 B	RR TAU
W TAU	784 5.7 Bl	776 11.1 Ch	776 11.2 Ch	817 10.7 Ch	053326
042215	786 5.5 Ht	804 11.8 L	794 11.8 Ch	817 9.4 Jo	804 11.1 L
776 10.9 Ch	791 5.6 Bl	R LEP	799 12.2 Jo	821 9.8 Pt	806 10.8 L
806 11.8 L	794 5.3 En	*045514*	821 12.2 Pt	822 9.3 Jo	806 11.2 B
826 10.8 Pt	799 5.5 En	677 7.3 Si	828 12.6 Ch	824 10.0 B	810 10.6 L
S TAU	799 5.2 Ht	678 7.2 Si	851 12.9 Pt	825 10.8 Ko	812 11.9 L
042309	804 5.3 En	682 7.2 Si	T PIC	827 9.7 Jo	823 12.4 L
776[13.9 Ch	804 5.4 Bl	765 7.1 Si	*051247*	828 10.6 Ch	RU AUR
T CAM	805 5.0 Sl	780 6.4 Ch	771 11.8 En	830 9.6 Jo	053337
043065	806 5.5 Ht	793 6.8 Ch	772 11.5 Ht	835 9.3 Sn	776 13.0 Ch
806 14.0 L	812 5.2 Ht	799 6.5 Jo	774 11.7 Bl	851 9.2 Pt	822[13.4 Bw
821 13.7 Pt	817 5.4 Bl	800 5.7 Ko	778 11.4 En	W AUR	834[12.4 Ch
844 12.8 L	823 5.2 Ht	801 5.7 Ko	780 11.5 Ht	052036	851[12.0 Pt
851 12.4 Pt	826 5.3 Bl	803 5.4 Sl	785 11.0 Bl	776 11.8 Ch	U AUR
858 12.0 Jo	828 5.2 Ht	804 6.1 Ko	791 11.2 Bl	806 12.6 L	053531
RX TAU	R CAE	820 5.7 Sl	794 10.0 En	828 13.0 Ch	776 12.9 Ch
043208	*043738*	V ORI	799 10.0 En	851[12.0 Pt	806 10.7 L
776 12.9 Ch	771 11.3 En	050003	799 10.7 Ht	S ORI	806 10.6 B
806 12.0 L	772 11.5 Ht	776 11.8 Ch	804 10.1 Bl	*052401*	824 8.4 B
R RET	773 10.9 Bl	799 10.0 Jo	804 9.5 En	776 11.5 Ch	825 8.4 L
043263	778 11.3 En	806 10.0 L	806 9.9 Ht	800 11.7 Ch	826 8.5 Pt
771 12.2 En	780 11.2 Ht	T LEP	812 9.4 Ht	T ORI	826 8.7 Sf
772 12.3 Ht	784 11.4 Bl	*050022*	817 8.9 Bl	*053005a*	828 8.6 Ch
773 12.3 Bl	791 11.7 Bl	771 8.7 En	823 8.8 Ht	737 11.1 Hr	831 8.5 Sf
778 12.4 En	794 11.7 En	773 8.8 Bl	826 8.9 Bl	744 10.7 Hr	838 8.2 L
780 12.5 Ht	799 11.9 En	778 8.8 En	828 8.8 Ht	776 11.4 Ch	SU TAU
784 12.5 Bl	799 11.8 Ht	785 8.8 Bl	T COL	785 10.9 Ch	054319
791 12.7 Bl	804 11.9 En	791 8.9 Bl	*051533*	794 11.4 Ch	776 9.7 Ch
794 12.5 En	804 11.7 Bl	794 9.1 En	771 8.1 En	799 11.3 Jo	793 9.7 Ch
799 12.5 En	806 12.0 Ht	799 10.2 En	772 8.3 Ht	800 11.5 Ch	800 9.8 Ch
804 13.0 Bl	812 12.0 Ht	804 9.8 En	774 7.8 Bl	802 11.5 Jo	804 9.5 L
805 13.4 Sl	826 12.5 Bl	804 9.8 Bl	778 8.1 En	804 11.2 L	806 9.5 L
826 13.0 Bl	R PIC	807 10.2 B	780 7.5 Ht	804 11.5 Ch	810 9.5 L
828 12.5 Ht	*044349*	817 10.0 Bl	785 7.8 Bl	805 11.0 L	812 9.4 L
X CAM	771 7.5 En	826 10.3 Bl	786 7.5 Ht	806 10.7 L	812 9.7 Pt
043274	772 7.9 Ht		791 7.6 Bl	806 11.3 B	815 9.6 Me
793 10.0 Ch	773 8.1 Bl		794 7.7 En	808 11.2 L	816 9.6 Pt

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
SU TAU	U ORI	R OCT	NOV PIC	R LYN	TW GEM
054319	054920a	*055686*	*063462*	065355	070122c
817 9.7 Ch	799 8.9 Jo	785 12.0 Bl	771 8.7 En	851[12.6 Pt	851 8.1 Pt
819 9.7 Pt	800 9.7 Ch	791 12.2 Bl	772 8.7 Ht	RS GEM	R CMI
819 9.6 Me	801 9.5 Ah	804 12.3 Bl	778 8.7 En	065530	070310
820 9.7 Me	802 8.9 Sl	806 12.2 Sl	780 8.7 Ht	819 10.6 Me	794 8.5 Ch
821 9.7 Pt	806 9.2 B	826 12.5 Bl	786 8.7 Ht	833 10.9 Me	799 8.1 Jo
823 9.6 L	813 9.9 Hf	X AUR	799 8.7 En	Z CMA	805 8.3 L
824 9.5 B	813 9.9 Wd	060450	799 8.7 Ht	*065911*	814 8.2 Jo
826 9.6 Pt	816 10.8 Wd	779 11.4 Ch	804 8.6 En	803 10.4 Sl	819 8.0 Jo
826 9.7 Sf	817 9.5 Jo	793 11.8 Ch	806 8.7 Ht	806 10.3 Sl	819 8.1 B
828 9.5 My	817 9.7 Ch	804 12.2 Ch	812 8.7 Ht	810 10.3 Sl	819 8.2 Me
830 9.6 Pt	819 9.7 Jo	805 12.0 L	823 8.4 Ht	820 10.3 Sl	822 7.5 Jo
833 9.6 Pt	820 10.6 Wd	806 12.5 B	828 8.5 Ht	V CMI	823 7.6 L
833 9.6 Me	821 10.0 Sn	824 12.0 B	S LYN	070109	823 7.6 Sn
836 9.6 Pt	829 10.1 Sn	825 12.0 L	063558	794[13.5 Ch	826 8.0 Pt
838 9.6 L	830 10.5 Wd	826 11.8 Pt	802 11.1 Ry	806[14.1 B	826 8.4 Sf
S COL	V CAM	828 11.8 Ch	806 10.8 Ry	835[13.5 Ch	831 8.4 Sf
054331	054974	835 11.0 Sn	806 10.9 L	R GEM	832 7.4 Sn
771[12.6 En	805 13.5 L	839 11.4 L	806 10.0 B	070122a	834 8.1 B
785 13.0 Bl	851[12.2 Pt	851 9.8 Pt	811 10.8 Ry	778 8.0 Ch	835 7.8 Ch
791 12.7 Bl	Z AUR	η GEM	822 10.5 Ry	799 8.8 Jo	838 7.9 L
794 12.2 En	055353	060822	822 9.9 Bw	801 9.5 Ah	R VOL
799 12.2 En	799 10.0 Jo	803 3.8 We	824 10.5 Ry	805 9.6 Ch	*070772*
804 12.2 En	806 9.7 B	826 4.1 We	824 10.1 B	806 9.3 B	780 13.2 Ht
804 12.2 Bl	811 10.2 Pt	V AUR	828 9.9 Ry	813 9.5 Hf	799 13.0 Ht
806 12.2 Ht	812 10.2 Pt	061647	828 9.7 Ch	813 9.7 Wd	806 12.0 Ht
812 12.2 Ht	815 10.3 Pt	794 10.4 Ch	833 9.5 Ry	814 9.6 Sh	812 12.0 Ht
817 12.0 Bl	816 10.0 Pt	807 9.1 L	836 9.5 Ch	814 9.1 Jo	823 12.2 Ht
823 11.9 Ht	817 10.0 Pt	808 8.7 L	838 9.1 L	816 10.0 Wd	828 11.8 Ht
826 11.5 Bl	819 10.3 Pt	819 9.0 Me	851 8.9 Pt	816 9.6 Sh	L_2 PUP
828 11.7 Ht	820 9.6 Jo	828 9.2 Ch	858 8.9 Bw	817 8.9 Jo	*071044*
Z TAU	821 10.0 Pt	V MON	X GEM	820 9.3 Jo	786 3.6 Sl
054615a	822 9.7 Jo	*061702*	064030	820 9.9 Wd	798 3.8 Sl
805 13.5 L	823 9.9 B	794 11.4 Ch	819 10.7 B	821 9.7 Sh	803 4.0 Sl
RU TAU	825 9.6 Jo	800 11.2 Ko	820 10.7 Bn	822 9.6 Jo	806 4.2 Sl
054615c	826 10.1 Pt	801 11.2 Ko	822 10.9 Bw	824 9.6 B	810 4.3 Sl
804[12.8 Ch	828 10.1 My	804 11.0 Ko	840 9.2 Mg	825 9.8 Wa	820 4.3 Sl
R COL	829 10.1 Mc	825 9.7 Ko	840 8.9 B	826 9.7 Sh	RR MON
054629	830 10.1 Pt	AG AUR	845 9.0 Bn	826 10.4 Pt	071201
772[13.0 Ht	831 10.0 Mc	062047	Y MON	827 10.4 Jo	805 13.4 L
785[13.0 Bl	833 10.2 Mc	804 10.1 L	065111	830 10.5 Jo	823 11.7 L
794[13.1 En	833 10.3 Pt	812 10.2 L	794 10.8 Ch	830 10.0 Wa	825 12.0 Bw
799[13.0 En	835 10.0 Sn	838 9.7 L	798 9.9 Th	830 10.3 Wd	829 11.3 Hi
804[13.0 Bl	836 10.6 Mc	846 9.5 L	805 9.7 L	830 9.9 Sh	835 10.8 Ch
812[13.0 Ht	836 10.0 Pt	UU AUR	817 9.6 Ch	832 10.3 Wd	838 9.8 L
828[13.0 Ht	844 10.0 Pt	062938	819 9.8 B	835 10.3 Ch	V GEM
α ORI	847 10.1 Pt	828 5.6 Mc	826 9.8 Pt	838 10.0 Wd	071713
054907	851 10.5 Mc	829 5.4 Mc	828 10.0 Ch	846 10.1 Wd	794 12.7 Ch
802 0.9 Si	852 10.6 Pt	831 5.6 Mc	838 9.8 L	848 10.1 Wd	805 13.6 L
806 0.8 Si	855 10.5 Pt	851 5.8 Mc	840 10.2 B	851 11.9 Pt	807 13.2 B
824 0.8 Mc	855 10.4 Mc	U LYN	X MON	Z GEM	822[13.8 Bw
828 0.8 Mc	862 10.7 Mc	063159	*065208*	070122b	834[13.4 B
U ORI	862 11.0 Pt	820 9.3 B	805 9.1 L	825 12.3 Wa	S CMI
054920a	863 11.0 Pt	R MON	823 8.4 L	826 12.5 Pt	072708
698 6.9 Si	868 11.0 Pt	063308	R LYN	830 12.6 Wd	794 12.0 Ch
717 7.4 Si	R OCT	794 13.0 Ch	065355	851 12.5 Pt	799 11.5 Jo
731 7.6 Si	*055686*	804 13.0 Ch	806 13.5 L	TW GEM	800 11.8 Ko
765 8.2 Si	770[12.0 En	835 12.8 Ch	820[13.0 B	070122c	801 11.8 Ko
776 8.2 Ch	774 12.1 Bl			826 8.1 Pt	804 11.5 Ko

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
S CMi	S GEM	R CNC	RT HYA	T HYA	RW CAR
072708	073723	081112	*082405*	*085008*	*091868*
817 10.9 Ch	822 13.1 Bw	815 7.3 Ad	813 8.0 Ko	839 12.2 L	772 9.6 Ht
819 10.9 B	823 13.0 B	816 7.6 Wd	815 7.9 Ko	T CNC	774 9.5 Bl
820 10.6 Me	826 13.0 Pt	817 7.4 Ch	817 7.9 Ko	085120	780 9.1 Ht
821 10.3 Sn	830 13.0 Mg	819 7.2 Jo	819 8.1 Me	801 9.0 Ch	785 9.2 Bl
822 11.2 Jo	835 12.7 Ch	819 7.0 B	820 7.9 Ko	822 8.5 Jo	786 9.4 Ht
824 10.3 Ko	840 12.6 Mg	820 7.1 Cy	821 7.9 Ko	824 9.7 Ch	791 9.4 Bl
826 10.2 Pt	840 12.2 B	820 7.4 Wd	823 7.8 L	826 9.4 B	794 9.4 En
826 10.2 Mn	845 12.0 Jo	822 6.8 Jo	825 7.8 Ko	826 8.6 Pt	797 9.3 En
827 10.2 Ko	850 11.5 Jo	825 6.8 Ad	826 8.0 Pt	827 8.6 Jo	799 9.6 Ht
828 10.3 Mn	851 11.2 Pt	826 6.6 Pt	829 8.2 Sn	848 8.7 Jo	802 9.4 En
829 10.1 Sn	852 11.7 Jo	826 6.9 Sf	838 8.0 L	851 8.8 Jo	804 9.6 Bl
830 10.0 Mn	W PUP	827 6.7 Hi	843 7.9 Ko	851 8.8 Pt	806 9.8 Ht
834 10.0 B	*074241*	827 6.4 Jo	854 7.8 Ko	858 8.8 Jo	812 9.7 Ht
835 9.9 Mn	771 8.2 En	829 7.0 Je	R CHA	Y HYA	817 9.8 Bl
850 9.5 Ko	772 8.1 Ht	830 6.8 Wd	*082476*	*090024*	823 10.2 Ht
852 9.4 Pt	774 8.3 Bl	830 6.5 Jo	772 12.6 Ht	804[12.4 Ko	826 10.2 Bl
854 9.3 Ko	780 8.9 Ht	832 6.6 Ad	774 13.0 Bl	820 12.0 Ko	828 10.0 Ht
T CMi	785 8.9 Bl	832 7.0 Wd	785[12.6 Bl	824 11.8 Ko	Y VEL
072811	786 8.9 Ht	834 6.7 B	799[12.6 Ht	T PYX	*092551*
794 11.9 Ch	791 9.2 Bl	835 6.2 Sn	804[12.6 Bl	*090031*	774 13.2 Bl
828 10.8 Ch	794 9.9 En	838 6.9 Wd	806[12.6 Sl	804 [t Bl	785 13.4 Bl
830 11.2 B	799 10.4 En	844 6.8 Wd	828[12.6 Ht	V UMA	791 13.2 Bl
Z PUP	799 10.4 Ht	848 6.8 Wd	U CNC	090151	804 13.4 Bl
072820b	804 10.8 En	848 6.7 Cy	083019	811 11.0 L	825[12.9 Ht
771 7.8 En	804 11.1 Bl	848 6.8 Oy	800[13.3 Ch	820 11.3 Me	826 13.5 Bl
794 7.2 En	807 11.4 Ht	849 6.8 Hi	807 14.3 L	825 11.1 Me	R CAR
799 7.4 En	818 12.4 Bl	850 6.9 Wd	823 13.9 B	826 11.0 Sf	*092962*
804 7.4 En	826 13.4 Bl	851 6.5 Pt	830 13.9 Ch	829 10.2 Mc	770 9.1 En
S VOL	T GEM	852 7.0 Hf	851[13.3 Bw	831 10.5 Mc	772 9.2 Ht
073173	074323	852 7.0 Sh	856 13.7 Bw	835 10.9 Sn	774 9.1 Bl
771 12.8 En	823 10.7 B	852 7.0 Wd	866 12.9 Bw	838 10.8 L	780 8.8 Ht
772 11.8 Ht	825 10.4 Bw	853 7.3 Ad	X UMA	848 10.7 Sf	785 8.8 Bl
774 12.9 Bl	826 10.2 Pt	864 7.4 Ad	083350	851 10.3 Mc	785 8.5 Sl
780 11.8 Ht	830 10.1 Mg	V CNC	810[12.0 Jo	854 10.4 B	786 8.7 Ht
785 12.2 Bl	835 9.9 Ch	081617	823 13.7 B	854 10.7 Sf	791 8.7 Bl
791 11.9 Bl	840 9.6 Mg	800 13.1 Ch	851[12.9 Pt	856 10.7 Mc	794 8.4 En
794 12.2 En	840 9.5 B	805 12.4 L	862[12.7 Mg	859 10.7 Sf	797 8.1 En
799 12.0 En	845 9.8 Jo	807 12.0 B	RV HYA	862 10.8 Mc	799 8.3 Ht
799 11.6 Ht	850 9.6 Jo	820 10.8 Cy	*083109*	866 10.7 Sf	802 8.1 En
804 12.0 En	851 9.2 Pt	821 10.5 Gy	850 7.6 W	W CNC	803 7.5 Sl
804 11.7 Bl	852 9.6 Jo	823 10.7 L	S HYA	090425	804 7.9 Bl
806 11.4 Ht	U PUP	823 10.6 B	084803	801[13.6 Ch	806 7.7 Ht
812 11.4 Ht	*075612*	824 10.5 B	780 8.0 Ch	805 14.6 L	808 7.6 En
817 11.7 Bl	794 9.8 Ch	826 10.5 Pt	801 8.4 Ah	823 13.5 B	810 7.4 Sl
823 11.4 Ht	830 11.7 B	830 9.6 Cy	805 8.5 Ch	823 13.6 L	812 7.3 Ht
826 11.7 Bl	835 11.7 Ch	830 10.2 Ch	817 8.7 Ch	830 12.5 Cy	813 7.3 En
828 11.4 Ht	R CNC	835 9.7 B	820 8.8 Me	830 13.5 Ch	817 6.9 Bl
U CMi	081112	838 9.5 L	821 8.4 Jo	839 13.0 L	821 6.6 Sl
073508	780 9.3 Ch	848 9.2 Cy	824 9.0 B	850 12.4 Cy	823 6.4 Ht
794 9.8 Ch	793 8.6 Ch	851 9.1 Pt	826 8.9 Pt	859 12.5 Cy	826 6.3 Bl
805 11.2 L	799 8.2 Jo	RT HYA	851 10.4 B	RX UMA	828 6.3 Ht
823 12.1 L	801 8.4 Ah	*082405*	851 10.2 Pt	090567	X HYA
824 11.8 B	805 7.7 Ch	798 8.4 Th	T HYA	811 10.9 L	*093014*
826 11.8 Pt	810 7.5 Jo	800 7.9 Ko	*085008*	838 10.4 L	794 12.5 Ch
828 11.6 Ch	810 7.5 Ad	801 7.9 Ko	801 13.1 Ch	850 10.1 L	824 12.9 B
838 12.3 L	813 7.9 Hf	804 7.9 Ko	805 13.0 L	RW CAR	830 12.8 Ch
852[12.3 Pt	813 8.1 Wd	807 7.9 L	823 13.0 L	*091868*	851[13.0 Pt
	814 7.4 Cy	812 7.9 Ko	835 12.5 Ch	771 9.4 En	

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.
Y DRA		R LEO		R LEO		Z VEL		RV CAR		W VEL	
093178		094211		094211		*094953*		*095563*		*101153*	
794	14.0 Ch	810	6.7 Ad	844	7.4 Wd	785	10.5 Sl	802	10.4 En	798	11.1 En
813	13.7 Wi	811	6.5 Ah	845	7.3 Oy	786	10.9 Ht	804	10.2 Bl	799	11.3 Ht
825	13.1 L	813	6.3 Sz	848	7.6 Oy	791	10.6 Bl	806	10.2 Ht	802	11.0 En
830	13.5 Ch	813	6.5 Sh	848	7.7 Jo	797	10.9 En	812	10.2 Ht	804	10.7 Bl
844	12.5 L	813	6.6 Wd	848	7.8 Ah	799	11.6 Ht	817	10.5 Bl	806	11.2 Ht
850	12.6 Cy	813	6.6 Hf	848	7.7 Wd	802	11.1 En	823	10.3 Ht	812	11.1 Ht
859	11.3 Cy	814	6.5 Sh	848	7.6 Sh	804	11.1 Bl	826	10.7 Bl	817	10.0 Bl
R LMi		815	6.6 Wa	849	7.7 Mn	806	11.9 Ht	828	10.5 Ht	825	10.5 Ht
093934		815	6.8 Ad	849	8.3 Me	806	11.0 Sl	S CAR		826	9.8 Bl
780	10.8 Ch	815	6.7 Oy	850	8.2 He	812	12.0 Ht	*100661*		U HYA	
809	9.2 Bc	816	6.5 Sh	850	7.7 We	817	12.2 Bl	771	7.5 En	*103212*	
813	9.2 Sz	816	6.8 Wd	850	7.7 Sh	821	11.6 Sl	772	8.1 Ht	824	5.5 Mc
820	9.1 Jo	818	6.5 Sh	850	8.2 Wd	825	12.5 Ht	780	8.2 Ht	828	5.3 Mc
821	9.6 Gy	819	7.1 Me	851	7.8 Sh	826	12.3 Bl	785	8.3 Bl	829	5.4 Mc
825	9.0 Jo	819	6.6 Hf	851	7.6 Ad	V LEO		785	8.3 Sl	831	5.5 Mc
826	9.4 Pt	820	6.5 Jo	851	7.7 Pt	095421		786	8.6 Ht	855	5.8 Mc
827	9.0 Jo	820	7.0 Wd	851	7.8 Hf	794	12.5 Ch	788	8.3 En	856	5.9 Mc
830	9.4 Ch	820	6.5 Bg	851	8.1 Mc	810	10.3 BE	791	8.3 Bl	862	5.7 Mc
832	8.8 Sn	821	6.6 Sh	851	7.8 Si	811	9.9 Cy	797	8.4 En	RZ CAR	
832	9.4 Wd	821	6.5 Sn	852	8.0 Wd	812	10.2 BE	799	8.1 Ht	*103370*	
838	8.9 Wd	823	6.8 Si	852	7.9 Hf	820	8.8 Jo	802	7.6 En	772	10.3 En
844	7.7 Wd	824	7.0 Mc	852	7.9 Sh	820	9.6 Cy	803	7.4 Sl	772	10.4 Ht
848	7.6 Wd	825	6.5 Jo	852	7.7 Jo	824	9.2 BE	804	7.5 Bl	780	10.4 Ht
849	7.5 Hi	825	6.4 Wa	855	7.9 Ah	825	9.3 Me	806	7.3 Ht	786	10.8 Ht
850	7.4 Jo	825	7.1 Ad	855	8.3 Mc	826	9.0 Cy	808	7.3 En	797	11.3 En
850	7.5 Wd	826	6.7 Sh	856	8.2 Mc	826	8.9 Pt	812	6.8 Ht	799	11.5 Ht
851	7.4 Ad	826	7.0 Mn	856	7.9 Mn	826	9.4 Sf	813	6.8 En	802	11.8 En
851	7.4 Pt	826	6.2 We	858	8.1 Sh	827	9.9 Jo	817	6.4 Bl	806	11.5 Ht
851	7.6 B	826	6.4 Pt	858	7.7 Jo	833	9.2 B	821	6.3 Sl	812	11.9 Ht
852	7.2 Jo	827	7.0 Jo	858	8.3 Si.	835	9.1 Ch	823	6.0 Ht	825	12.7 Ht
852	7.4 Hf	828	7.0 Mn	859	8.1 Wd	848	9.8 Cy	826	6.3 Bl	R UMA	
852	7.4 Sh	828	7.5 Mc	861	7.8 Jo	848	9.6 Sf	828	6.0 Ht	103769	
852	7.4 Wd	829	6.6 Sn	862	8.5 Mc	851	10.0 Pt	U UMA		794	11.8 Ch
855	6.9 Ah	829	6.6 Je	863	8.0 Jo	854	9.8 Sf	100860		801	11.5 Ah
858	6.8 Jo	830	6.9 Sh	864	7.6 Ad	854	10.1 B	802	6.8 Mn	802	11.2 Cy
859	6.9 Wd	830	7.4 Wd	866	8.1 Fd	858	10.0 Cy	807	6.7 Mn	805	11.5 Ch
861	6.6 Jo	830	6.5 Wa	867	8.1 Wd	858	10.3 Jo	825	6.8 Mn	808	11.5 Ah
863	6.5 Jo	830	6.8 Ch	867	8.1 Sh	859	10.0 Sf	828	6.8 Mn	810	10.4 Jo
863	6.5 Me	830	7.2 Mn	L CAR		861	10.4 Jo	830	6.7 Mn	812	10.7 B
864	6.8 Ad	831	7.3 Mc	*094262*		863	10.5 Jo	835	6.6 Mn	813	10.4 Wd
866	6.3 Fd	832	7.1 Hf	786	4.0 Sl	866	10.4 Sf	849	6.6 Mn	813	10.4 Hf
866	6.8 Hi	852	7.5 Wd	803	3.6 Sl	RR CAR		856	6.8 Mn	813	10.0 Sz
867	6.9 Sh	832	7.4 Ad	806	3.5 Sl	*095458*		Z CAR		814	10.4 Cy
867	6.8 Wd	832	7.5 Oy	810	3.6 Sl	772	7.9 Ht	*101058a*		816	10.0 Wd
RR HYA		833	7.1 Sh	Y HYA		780	7.9 Ht	772	12.6 En	820	9.6 Wd
094023		833	7.3 Me	*094622*		786	8.0 Ht	772	12.3 Ht	821	9.0 Gy
771	12.8 En	835	7.0 Sn	771	8.0 En	797	8.0 En	780	12.5 Ht	821	8.5 Cy
798	11.8 En	835	7.4 Mn	780	7.3 Ch	799	8.3 Ht	785	12.4 Bl	824	8.8 Ch
802	11.6 En	836	7.2 We	802	8.0 En	806	8.4 Ht	791	12.6 Bl	825	7.6 Ad
R LEO		837	7.4 Wd	826	6.6 Pt	812	8.4 Ht	804	12.7 Bl	826	8.8 Pt
094211		837	7.3 Sh	835	7.2 Ch	825	8.4 Ht	826	13.1 Bl	827	8.3 Ah
779	6.0 Ch	838	7.3 Sh	Z VEL		RV CAR		W VEL		828	8.5 Mn
793	6.5 Ch	838	7.3 Hf	*094953*		*095563*		*101153*		829	8.5 Mc
799	6.2 Jo	838	7.3 Wd	771	10.2 En	780	13.1 Ht	772	11.6 En	829	8.1 Sn
801	6.2 Ah	842	7.0 Sn	772	10.1 Ht	785	12.0 Bl	772	11.7 Ht	829	8.0 Je
803	5.6 We	842	7.3 Ah	774	10.3 Bl	791	11.1 Bl	780	11.7 Ht	830	8.5 Wd
807	6.7 Mn	844	7.5 Jo	780	10.7 Ht	797	10.5 En	785	11.1 Bl	830	8.6 Wa
810	6.2 Jo	844	7.5 Sh	785	10.4 Bl	799	10.3 Ht	791	10.9 Bl	830	7.8 Cy

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

R UMa — 103769

J.D.	Est.	Obs.
830	8.4	Mn
831	8.2	Mc
832	8.1	Wd
832	7.4	Ad
835	7.8	Mn
838	8.0	Wd
841	7.7	Cy
842	7.5	Sn
844	8.1	Wd
845	7.4	Jo
849	7.5	Hi
849	7.5	Mn
850	7.5	Wd
851	7.1	Ad
851	7.0	Jo
851	7.6	Mc
851	7.0	Pt
852	7.6	Wd
852	7.5	Sh
852	7.5	Hf
854	7.4	B
855	7.5	Mc
855	7.6	Ah
856	7.7	Mc
856	7.3	Mn
857	7.7	Je
858	7.4	Jo
858	7.7	Cy
859	7.7	Wd
861	7.6	Jo
862	7.7	Mc
863	7.9	Hf
863	7.7	Jo
863	7.8	Wd
866	7.8	Hi
865	7.2	Me
866	7.8	Wd
866	7.6	Fd
867	7.9	Wd
867	7.8	Sh

V HYA — *104620*

J.D.	Est.	Obs.
771	7.6	En
780	7.0	Ch
785	6.5	Bl
791	7.0	Bl
798	7.6	En
800	6.7	Ko
802	7.7	En
804	6.9	Ko
805	6.8	L
805	7.0	Bl
808	7.8	En
811	6.9	Ko
813	6.9	Ko
815	6.9	Ko
817	7.0	Ko
817	7.0	Bl

V HYA — *104620*

J.D.	Est.	Obs.
823	7.0	L
825	7.1	Ko
826	6.8	Pt
826	7.6	Bl
828	7.8	Ch
839	7.0	L
843	7.1	Ko
851	7.1	Ko
851	7.0	Pt
852	7.0	We

RS HYA — *104628*

J.D.	Est.	Obs.
772	10.6	En
785	11.3	Bl
791	11.4	Bl
798	12.0	En
805	11.8	Bl
817	12.5	Bl
826	12.8	Bl

W LEO — 104814

J.D.	Est.	Obs.
794	13.9	Ch
807	13.9	L
812	14.4	BE
824	13.5	BE
838	13.8	Ch

RS CAR — *110361*

J.D.	Est.	Obs.
772[	12.8	En
798[	12.3	En

S LEO — 110506

J.D.	Est.	Obs.
794	13.8	Ch
807	13.9	L
825	12.6	L
830	12.3	Cy
838	11.8	Ch
839	12.1	L
851	11.4	Pt
865	10.2	Mg

RY CAR — *111561*

J.D.	Est.	Obs.
772[	13.1	En
785[	13.1	Bl
794[	13.1	En
805[	13.5	Bl
823[	13.1	Ht
828[	13.1	Ht

RS CEN — *111661*

J.D.	Est.	Obs.
817	10.0	Bl
823	9.5	Ht
826	9.0	Bl
828	9.0	Ht

X CEN — *114441*

J.D.	Est.	Obs.
772	12.0	En
772	12.0	Ht
780	11.4	Ht
785	11.2	Bl
786	11.3	Ht
791	10.7	Bl
798	11.3	En
799	10.8	Ht
802	11.1	En
805	10.7	Bl
806	10.6	Ht
812	10.5	Ht
817	9.7	Bl
825	9.0	Ht
827	8.4	Bl

AD CEN — *114858*

J.D.	Est.	Obs.
772	9.4	Ht
780	9.1	Ht
786	9.3	Ht
799	9.3	Ht
806	9.3	Ht
812	9.5	Ht
823	9.1	Ht
828	9.3	Ht

W CEN — *115058*

J.D.	Est.	Obs.
780	13.0	Ht
785	12.8	Bl
798	12.6	En
799	12.6	Ht
802	12.0	En
805	11.6	Bl
806	11.7	Ht
812	11.6	Ht
817	10.6	Bl
823	11.0	Ht
826	9.9	Bl
828	10.3	Ht

R COM — 115919

J.D.	Est.	Obs.
792	9.4	Ch
799	9.9	Jo
802	9.5	Cy
811	9.5	Cy
821	9.5	Cy
823	9.5	Ws
826	9.5	Pt
828	9.5	My
830	9.5	Cy
838	9.9	Ch
839	10.0	Cn

R COM — 115919

J.D.	Est.	Obs.
848	10.0	Cy
850	10.6	Hi
851	10.5	Pt
851	10.9	Jo
858	11.5	Jo

SU VIR — 120012

J.D.	Est.	Obs.
825	12.1	Bw
825	12.4	L
838	11.8	Ch
839	12.2	L
839	12.1	Bw
841	13.5	BE
851	11.8	Pt
851	11.3	Bw
862	11.2	Mg
863	10.5	Bw

T VIR — *120905*

J.D.	Est.	Obs.
807	13.2	L
807	13.0	B
833	13.9	B
851[	12.4	Pt
862[	12.8	Mg

R CRV — *121418*

J.D.	Est.	Obs.
785	13.7	Sl
806	13.7	Sl
807	12.9	L
807	13.5	B
820	13.0	Sl
825	12.3	L
825	11.5	Me
826	12.0	Pt
833	11.9	B
839	11.5	L
850	12.0	Jo
851	11.3	Mc
851	11.8	Pt
852	12.0	Jo
854	11.1	B
855	11.0	Mc
858	11.9	Jo
861	11.5	Jo
862	10.6	Mc
866	11.0	Fd

SS VIR — *122001*

J.D.	Est.	Obs.
817	7.3	Ko
820	7.5	Jo
821	7.2	Ko
824	7.2	L
825	7.4	Ko
826	7.3	B
827	7.3	Ko
830	7.6	Jo
839	7.2	L
842	7.0	Ko
851	7.2	Ko
851	7.4	Jo
858	7.4	Jo
863	7.6	Jo

T CVN — 122532

J.D.	Est.	Obs.
778	10.0	Ch
798	10.0	Th
799	9.7	Jo
802	9.8	Jo
802	10.5	Cy
807	10.5	B
811	10.5	Cy
821	10.5	Cy
826	10.5	Pt
828	10.2	Th
830	10.0	Cy
830	10.0	Wa
833	10.0	Th
836	10.0	Th
848	10.2	Cy
850	10.2	Hi
851	10.2	Pt
858	9.6	Jo
861	9.8	Jo
863	10.0	Jo
866	9.9	Fd
867	9.6	Pc

Y VIR — *122803*

J.D.	Est.	Obs.
800	9.4	Ch
807	9.9	L
825	10.2	L
826	10.8	B
828	10.0	My
839	11.6	L
851	12.1	B
862	12.7	Mg

U CEN — *122854*

J.D.	Est.	Obs.
772	8.7	En
772	9.3	Ht
780	9.7	Ht
785	9.5	Bl
786	10.0	Ht
792	10.3	Bl
798	10.6	En
799	10.4	Ht

U CEN — *122854*

J.D.	Est.	Obs.
802	11.1	En
805	10.8	Bl
806	11.2	Ht
812	11.6	Ht
817	11.7	Bl
825	12.5	Ht
826	11.9	Bl

T UMi — 123160

J.D.	Est.	Obs.
807	13.2	B
813	12.7	Wi
830	12.6	Pt
835	12.1	B
837	13.5	Cn
838	11.1	Wd
838	12.1	Ch
850	11.1	Wd
851	11.0	Jo
851	11.7	Pt
852	10.7	Jo
855	11.0	Ah
859	10.1	Wd
861	10.8	Jo
863	10.4	Jo
863	9.8	Wd
863	9.8	Hf
866	9.8	Wd
867	9.7	Wd
867	9.7	Sh
869	10.0	Fd

R VIR — 123307

J.D.	Est.	Obs.
778	11.2	Ch
799	10.0	Jo
802	9.5	Jo
811	9.2	Me
813	8.5	Sz
820	7.9	Jo
821	7.9	Sn
823	7.5	B
824	7.8	Mc
825	7.4	Ad
826	8.0	Mn
828	7.6	Mn
829	7.9	Mc
829	7.6	Sn
830	7.5	Mn
830	7.5	Pt
831	7.7	Mc
832	8.0	Wd
832	7.3	Ad
835	7.3	Mn
835	7.5	Sn
838	7.6	Ch
838	7.7	Wd
839	7.5	Mc
845	7.3	Oy
848	7.4	Oy

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.
R VIR		RS UMA		S UMA		U VIR		W VIR		S VIR	
123307		123459		123961		124606		*132002*		*132706*	
848	7.2 Ah	835	8.9 B	829	8.7 Sn	821	10.0 Sn	851	9.5 Ko	807	11.7 Ht
849	6.7 Mn	835	8.6 Mn	830	9.3 Wd	825	10.7 L	854	9.7 Ko	809[	11.1 Bc
850	7.6 Wd	837	8.6 Cn	830	9.4 Pt	826	11.0 B	865	9.6 Mg	810	12.0 Sl
851	7.3 Pt	838	8.9 Ch	830	9.0 Mn	827	10.0 Ah	V VIR		811	12.1 Ch
851	7.6 Hl	838	8.8 Wd	832	8.8 Hf	829	11.0 Sn	*132202*		820	12.0 Jo
851	7.2 He	841	8.9 Cy	832	9.3 Wd	830	11.5 Pt	800	11.3 Ch	820	11.5 Sl
852	7.5 Jo	843	9.3 Ry	835	9.4 B	835	11.7 Sn	801	11.6 Ko	825	11.9 Me
853	6.8 Ad	844	8.9 Wd	835	8.8 Sn	838	11.6 Ch	805	11.6 L	825	11.7 Ht
855	7.3 Mc	845	9.3 Bn	835	9.2 Mn	842	11.8 L	829[	10.6 Sn	829	12.0 Sn
855	7.4 Ah	845	8.8 Jo	837	9.2 Cn	850	12.0 Hi	851	13.6 Cy	830	11.8 B
856	7.1 Mc	848	8.8 Jo	838	9.3 Hf	851	12.3 B	865[	13.2 Mg	830	11.8 Pt
856	7.3 He	848	9.6 Cy	838	9.1 Wd	862	13.0 Mg	R HYA		834	11.9 Ch
856	7.3 Mn	849	9.1 Mn	838	9.7 Ch	RV VIR		*132422*		851	11.0 Pt
858	7.6 Jo	850	9.9 Wd	844	9.5 Wd	*130212*		772	5.7 Ht	851	11.4 Jo
862	7.4 Mc	851	8.9 Jo	848	9.5 Jo	802	12.2 Cy	778	5.3 Ch	858	11.6 Jo
863	7.5 Jo	851	9.6 Pt	849	9.8 Mn	807	12.7 L	780	5.3 Ht	865	10.7 Mg
864	7.2 Ad	856	9.3 Mn	850	9.7 Wd	821	12.8 Bw	785	5.4 Bl	RV CEN	
867	7.8 Wd	858	9.5 Jo	851	9.6 Mc	839	13.5 Bw	785	5.4 Sl	*133155*	
867	7.9 Sh	858	9.7 Cy	851	9.6 Jo	839	13.1 L	786	5.3 Ht	772	7.6 Ht
RS UMA		859	9.9 Wd	851	10.3 Pt	851	14.0 Bw	792	5.5 Bl	780	7.7 Ht
123459		861	9.8 Jo	855	10.3 Ah	856	14.0 Bw	794	5.5 En	785	7.8 Bl
778	11.3 Ch	863	9.9 Jo	856	9.8 Mc	863[	13.3 Bw	798	5.5 En	786	7.8 Ht
792	9.8 Ch	863	9.7 Hf	856	10.4 Mn	U OCT		799	5.5 Ht	792	7.7 Bl
799	9.4 Jo	863	9.8 Wd	858	10.4 Jo	*131283*		800	5.6 En	798	8.2 En
802	9.6 Jo	866	9.9 Wd	859	10.2 Wd	771	9.2 En	801	5.8 Ch	799	7.8 Ht
802	9.4 Mn	866	10.3 Ry	861	10.6 Jo	772	9.2 Ht	801	5.5 Ko	800	8.4 En
802	9.1 Cy	867	10.0 Wd	862	10.3 Mc	780	9.4 Ht	802	5.4 En	805	8.0 Bl
802	9.5 Ry	867	10.0 Sh	863	9.9 Wd	785	9.4 Bl	805	5.8 Bl	806	8.0 Ht
807	8.9 Mn	869	10.4 Ry	863	9.8 Hf	786	9.4 Ht	806	5.4 Sl	812	8.0 Ht
810	8.6 Jo	869	10.4 Fd	863	10.4 Jo	792	9.8 Bl	806	5.8 We	818	8.3 Bl
810	9.0 Ry	874	10.6 Ry	866	9.9 Wd	796	10.1 En	807	5.9 Ht	823	8.2 Ht
812	8.6 B	878	10.8 Ry	867	11.0 Pc	799	9.9 En	808	6.0 We	826	8.5 Bl
813	8.5 Hf	S UMA		869	10.7 Fd	799	10.3 Ht	808	6.0 En	828	8.4 Ht
813	8.6 Wd	123961		RU VIR		805	10.5 Bl	810	5.5 L	T UMI	
813	8.9 Cy	782	8.2 Ch	124204		807	10.4 Ht	810	5.5 Sl	133273	
813	8.5 Wi	799	7.7 Jo	802	12.1 Cy	814	11.0 Ht	812	5.9 Ht	802	10.7 Jo
816	8.6 Wd	801	8.2 Ah	805	12.1 L	817	10.9 Bl	818	5.8 Bl	802	12.0 Cy
816	9.0 Ry	802	7.7 Jo	807	12.0 B	825	11.5 Ht	820	6.1 Sl	810	12.4 L
819	8.5 Bn	802	7.9 Mn	821	11.7 Cy	826	11.1 Bl	820	6.2 Ch	830	13.0 B
819	8.5 Jo	807	8.1 Mn	821	11.9 Bw	V CVN		825	6.0 Ht	838	13.2 L
820	8.9 Cy	808	8.3 Ah	830	11.7 Cy	131546		826	6.4 We	851	13.1 Cy
821	8.8 Gy	810	8.0 Jo	830	11.8 Pt	829	6.9 GD	826	5.6 Bl	852	13.6 B
821	8.8 Ry	812	8.3 B	833	10.8 B	836	7.4 Th	827	6.5 L	T CEN	
824	8.9 Me	813	8.2 Sz	839	11.2 L	843	7.5 Th	830	6.5 Pt	*133633*	
825	8.3 Mn	813	8.3 Hf	850	10.7 Cy	847	7.6 Th	834	6.8 We	772	5.9 Ht
825	8.9 Ry	813	8.6 Wd	851	11.4 Pt	849	7.9 GD	836	7.0 We	780	5.9 Ht
826	8.7 Cy	813	8.3 Wi	856	10.7 Bw	858	7.5 GD	838	6.5 Ch	785	6.1 Sl
827	9.0 Bn	816	8.7 Wd	859	10.7 Cy	869	7.3 GD	842	6.1 L	786	5.9 Ht
828	8.6 Mn	819	8.5 Jo	862	10.7 B	W VIR		851	6.8 Pt	792	6.5 Bl
829	8.8 Sn	820	8.5 Hf	862	11.0 Mg	*132002*		S VIR		794	6.4 En
830	8.7 Sh	821	8.7 Gy	869	10.7 Bw	800	9.2 Ko	*132706*		798	6.7 En
830	8.7 Wd	821	8.7 Sn	U VIR		801	9.2 Ko	772[	12.1 Ht	799	6.7 Ht
830	8.5 Pt	824	8.8 Me	124606		811	9.7 Ko	785	12.7 Sl	800	6.5 En
830	9.0 Ry	825	8.9 Mn	799	8.8 Jo	820	9.6 Ko	798[	12.3 En	805	6.7 Bl
830	8.6 Mn	827	8.5 Ah	801	9.3 Ah	824	10.0 Ko	800	12.3 En	806	6.7 Sl
832	8.9 Wd	828	9.1 Mc	804	9.4 Ch	825	10.4 Ko	802	12.3 En	807	6.8 Ht
833	8.9 Ry	828	9.0 Mn	805	9.5 L	829	9.9 Sn	803[	12.0 Bf	808	7.4 En
835	8.7 Sn	829	9.1 Mc	808	9.5 Ah	841	9.9 Ko	806	12.1 Sl	810	6.8 Sl

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
T CEN	T APS	U UMI	S BOO	V BOO	R BOO
133633	*134677*	141567	141954	142539a	143227
812 7.6 En	800 12.0 En	808 8.1 Ah	833 8.4 Me	832 7.6 Ad	838 8.7 Wd
812 7.0 Ht	805 12.5 Bl	811 8.0 Ah	833 9.0 B	833 8.9 B	839 8.8 Me
818 6.5 Bl	807 12.7 Ht	813 8.3 Sz	833 8.8 Th	834 8.2 Ch	840 8.6 B
825 6.7 Ht	826 13.2 Bl	814 7.7 Jo	834 8.2 Ch	835 8.7 Sn	848 8.4 Wd
826 6.5 Bl	828[13.2 Ht	819 7.6 Me	836 8.4 We	835 8.9 Mn	848 8.2 Ah
RT CEN	RR VIR	820 7.7 Jo	836 9.0 Th	839 9.2 Me	848 8.0 Jo
134236	*135908*	821 7.6 Cy	838 8.8 L	841 8.6 Cy	850 8.5 Wd
772 9.6 Ht	830 10.9 B	822 7.6 Jo	843 9.4 Th	848 8.8 Jo	851 7.3 Ad
780 9.8 Ht	830 10.4 Pt	826 7.7 Mn	848 8.7 Jo	848 9.0 Sf	851 7.6 Pt
786 10.4 Ht	850 11.0 Sf	826 7.7 Cy	851 9.2 Pt	849 9.0 Mn	852 7.9 Jo
792 10.5 Bl	851 11.4 Pt	827 8.1 Ah	852 8.6 We	849 9.1 GD	855 8.2 Ah
798 11.1 En	858 11.5 Sf	828 7.6 Mn	861 9.4 Jo	850 9.2 He	859 8.3 Wd
799 10.9 Ht	862 11.6 Mg	830 7.7 B	863 9.7 Jo	850 9.0 Cy	861 8.0 Jo
800 11.4 En	Z BOO	830 8.4 Pt	RS VIR	851 8.8 Pt	863 7.6 Jo
805 11.1 Bl	140113	830 7.6 Mn	142205	854 9.1 Sf	869 7.8 Pc
807 11.1 Ht	800 11.8 Ch	831 7.8 Sf	800 13.2 Ch	855 9.0 Ah	V LIB
812 10.9 Ht	810 12.2 L	835 8.3 My	805 13.2 L	856 9.2 He	*143417*
818 10.9 Bl	824 12.9 B	835 8.0 Mn	811 13.0 Cy	858 9.3 GD	805 13.6 L
825 11.4 Ht	838 13.4 L	835 8.0 Sn	824 13.7 B	859 9.1 Cy	S LUP
826 11.3 Bl	840 13.2 B	841 8.3 Cy	838 13.4 Ch	861 8.7 Jo	*144646a*
R CVN	Z VIR	849 8.6 Mn	838 13.8 L	863 8.7 Jo	802 11.9 En
134440	*140512*	849 8.7 Hi	851 13.4 Cy	865 9.1 GD	810 12.6 Sl
778 8.2 Ch	800[13.2 Ch	850 8.3 Jo	V BOO	866 9.2 Sf	U BOO
799 8.6 Jo	851 12.6 Pt	850 8.5 Sf	142539a	R CAM	144918
801 8.9 Ah	862 11.7 Mg	851 8.8 Pt	782 7.7 Ch	142584	802 12.0 Cy
802 8.9 Jo	RU HYA	852 9.2 B	799 7.7 Jo	778 8.6 Ch	812 12.0 Cy
807 8.8 B	*140528*	855 8.9 Ah	801 8.2 Ah	805 9.8 Ch	821 11.4 Bw
808 9.0 Ah	772[13.5 Ht	855 8.5 We	802 7.9 Jo	812 10.2 Me	824 11.7 B
810 8.8 Jo	798[12.5 En	856 9.0 Mn	802 8.1 Cy	829 11.2 GD	831 11.8 Cy
813 8.6 Wi	800[12.5 En	857 8.7 Sf	807 8.2 Mn	833 11.5 B	834 11.5 Ch
814 9.1 Jo	805[13.5 Bl	859 8.8 Cy	808 8.2 Ah	853 11.0 GD	840 11.5 B
821 9.2 Jo	825 13.5 Ht	866 9.4 Sf	810 8.0 Jo	R BOO	843 12.0 Cy
821 9.5 Gy	R CEN	867 9.0 Pc	810 7.5 Ad	143227	851 11.3 Cy
821 9.7 Sn	*140959*	S BOO	811 8.1 Cy	799 11.3 Jo	859 11.3 Cy
822 9.4 Jo	772 6.4 En	141954	811 9.1 GD	801 10.9 Ah	870 11.5 Bw
823 10.0 Ws	772 6.5 Ht	792 8.5 Ch	811 8.6 Me	802 11.1 Ch	Y LUP
829 10.3 Sn	780 6.5 Ht	798 8.0 Th	812 8.3 B	802 10.7 Jo	*145254*
830 10.3 Pt	786 6.5 Ht	799 8.2 Jo	814 7.8 Jo	808 10.1 Ah	792 13.5 Bl
834 10.0 Ch	788 6.7 En	802 8.2 Jo	814 7.6 Ad	810 10.1 Me	800[13.7 En
851 10.2 Pt	792 6.8 Bl	805 8.0 Th	819 8.4 Jo	811 9.9 Ah	805[13.7 Bl
851 10.2 Hl	794 6.8 En	810 8.1 L	822 8.4 Jo	811 9.0 GD	S APS
855 10.3 Ah	799 6.6 Ht	810 8.4 Jo	824 8.1 Mc	812 9.8 B	*145971*
861 10.3 Jo	800 7.0 En	810 7.9 Me	825 8.9 Mn	813 9.5 Sz	773[13.4 Bl
863 10.4 Jo	805 7.5 Bl	812 8.2 B	825 7.5 Ad	814 7.6 Ad	780[13.4 Ht
RX CEN	806 6.5 Sl	814 8.2 Jo	825 8.2 Cy	814 9.6 Jo	792[13.4 Bl
134536	807 6.7 Ht	817 8.2 Jo	826 9.0 Sh	819 9.0 Jo	796[12.5 En
772[13.1 Ht	808 7.0 En	819 8.4 Jo	826 8.6 Sf	820 9.4 Me	800[12.5 En
798[13.1 En	812 6.9 Ht	821 8.5 Gy	827 8.8 Ah	821 6.7 Sh	806 14.0 Sl
800[13.1 En	812 7.1 En	822 8.2 Jo	828 8.5 Mc	821 9.4 Sn	812[12.5 Ht
805[13.1 Bl	818 7.0 Bl	823 8.2 Ws	828 9.0 Mn	822 9.3 Jo	818[12.5 Bl
825[13.1 Ht	823 7.0 Ht	825 8.0 L	829 8.7 Mc	824 9.3 Me	826[13.4 Bl
T APS	826 7.7 Bl	827 7.8 Jo	829 8.8 GD	826 6.6 Sh	828[13.4 Ht
134677	828 6.9 Ht	827 8.0 We	830 8.9 Pt	827 8.7 Ah	RT LIB
771 10.0 En	U UMI	828 8.4 Th	830 8.4 Jo	829 9.1 Sn	*150018*
772 10.6 Ht	141567	829 8.4 Sn	830 8.9 Mn	830 9.0 Pt	851 11.8 B
780 11.0 Ht	801 8.1 Ah	829 8.4 GD	831 8.4 Cy	830 8.8 Jo	851 11.7 Pt
792 11.3 Bl	802 7.9 Jo	830 8.4 Pt	831 8.8 Mc	834 9.2 Ch	851 11.8 Bw
799 12.0 Ht	802 7.8 Cy	830 7.9 Jo		838 6.4 Sh	852 11.5 Sf

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
RT LIB	S CRB	W LIB	Z LIB	R CRB	R CRB
150018	151731	*153215*	*154020*	154428	154428
858 10.9 Sf	802 11.9 Ch	805 13.0 Bl	818 12.0 Bl	814 5.9 Ad	830 6.0 Pt
858 10.8 Bw	830 12.1 Pt	835[13.4 Ch	R CRB	815 5.8 Wa	830 6.0 Jo
865 9.7 Mg	835 12.5 B	S UMi	154428	815 5.9 Ko	830 5.9 Cy
866 10.2 Sf	850 10.5 Bc	153378	710 6.0 Si	815 6.0 Pt	830 5.9 He
870 9.3 Bw	851 10.9 Bf	778 10.1 Ch	743 6.2 Hr	815 6.0 Me	830 5.9 Mn
T LIB	851 10.5 Bc	799 9.0 Jo	748 6.3 Hr	815 6.0 Cy	831 5.8 Me
150519	851 12.5 Pt	800 9.5 Ko	750 6.3 Hr	816 6.0 Cy	831 5.9 Cy
825 11.7 L	867 12.6 Pc	801 9.5 Ko	754 6.2 Hr	816 6.0 Pt	831 6.2 We
825 11.5 Me	RS LIB	801 9.6 Ah	756 6.1 Hr	816 6.0 Ko	832 6.0 Oy
830 11.7 Pt	*151822*	804 9.5 Ko	763 6.2 Si	817 5.9 Ko	832 5.9 Cy
835 11.8 Ch	772 11.3 Ht	805 9.6 Ko	766 6.3 Hr	817 6.1 Pt	832 6.0 He
838 11.9 L	780 11.2 Ht	808 9.8 Ah	768 6.1 Hr	817 6.0 Cy	832 6.0 Hf
851 12.4 Pt	799 11.4 Ht	812 9.5 Ko	769 6.1 Hr	817 6.0 Jo	832 5.8 Ad
852 12.8 B	800 11.5 En	813 9.5 Ko	770 6.0 Hr	818 6.1 Sh	833 5.9 Ko
865 13.2 B	805 11.3 Bl	815 9.4 Me	771 6.1 Hr	819 6.0 Jo	833 5.9 Cy
865 13.3 Mg	805 11.4 L	817 9.1 Ko	772 6.1 Hr	819 6.0 Pt	833 5.9 Pt
Y LIB	807 11.5 Ht	820 8.8 Jo	776 6.1 Hr	819 6.0 Me	833 6.0 Me
150605	814 11.5 Wi	821 9.7 Gy	778 6.1 Ch	820 6.0 Jo	834 5.6 Me
805 13.4 L	818 11.0 Bl	822 8.8 Jo	780 6.4 Hr	820 6.0 Hf	834 5.7 Pt
830 13.4 Pt	825 11.4 Ht	824 9.1 Ko	784 6.0 Hr	820 6.0 Wd	834 6.0 Ch
838 12.3 L	825 11.5 L	825 8.8 Ko	799 5.8 Ko	820 5.9 Ko	835 5.8 Mn
840 12.7 B	826 10.8 Bl	826 9.7 Sf	799 6.0 Jo	820 6.0 Me	835 5.5 Pt
851 12.4 Pt	840 11.0 L	827 9.5 Jo	800 6.2 Ch	820 5.9 Cy	835 5.6 Me
865 10.7 Mg	RU LIB	830 9.4 Jo	801 6.2 We	820 6.1 Ch	836 5.6 Me
V CRB	*152714*	830 8.9 Pt	801 5.8 Ko	821 6.0 Pt	836 5.8 Pt
151432	805 13.3 L	830 9.4 B	801 6.0 Ah	821 5.9 Cy	836 5.8 Ko
826 7.6 Mn	835[13.1 Ch	832 9.8 Sn	802 5.9 Cy	821 5.9 Gy	836 5.9 Cy
828 8.2 Mn	838 13.8 L	836 9.6 Ch	803 5.9 Cy	823 6.0 L	837 6.0 Sh
830 7.6 Mn	851[13.1 Pt	842 8.9 Sn	804 5.9 Cy	823 6.0 Si	837 6.0 Cn
835 8.4 Mn	856 13.8 Bw	842 8.6 Rn	804 6.0 L	824 5.9 Ko	838 6.0 Wd
850 7.8 Bc	863 13.8 Bw	842 8.7 Ko	804 5.9 Ko	824 6.0 Me	838 6.0 Hf
850 7.8 Bf	R NOR	846 8.7 Ko	806 6.3 Ch	824 6.0 Pt	838 6.0 Si
851 7.5 Bf	*152849*	848 8.8 Jo	806 6.0 L	825 6.0 Me	838 6.0 Ch
851 7.8 Bc	772 10.0 Ht	848 9.4 Sf	806 6.0 Si	825 6.0 Cy	838 5.6 Me
S LIB	780 9.9 Ht	851 8.6 Ko	807 6.0 L	825 6.0 Pt	838 6.0 L
151520	786 10.2 Ht	851 8.8 Pt	807 6.0 Mn	825 6.0 L	839 6.0 L
807 10.4 L	792 9.8 Bl	852 9.1 B	808 6.1 Ah	825 5.9 Ad	839 6.0 Si
814 9.8 Wi	799 10.0 Ht	854 9.2 Sf	808 6.2 We	825 6.0 Jo	839 5.6 Me
824 9.4 Me	800 10.1 En	855 8.6 We	810 6.0 L	826 6.0 Sh	840 5.9 Me
825 9.4 L	804 9.9 En	855 9.0 Ah	810 5.8 Me	826 6.2 We	840 6.0 Mg
830 9.4 Pt	805 9.8 Bl	863 8.8 Jo	810 6.0 Ad	826 5.9 Ko	840 6.0 L
832 9.3 Sn	807 10.2 Ht	866 9.2 Sf	811 5.9 Ko	826 5.9 Pt	840 5.6 Pt
835 9.2 Ch	814 10.0 Ht	U LIB	811 6.1 Pt	826 5.9 Cy	841 5.8 Ko
839 9.0 L	818 9.3 Bl	*153620a*	811 5.9 Me	827 6.0 Cy	841 5.9 Cy
842 8.9 Sn	823 9.4 Ht	805[12.9 Bl	811 5.9 Cy	827 6.0 Ko	841 6.0 L
842 9.4 Rn	827 9.0 Bl	T NOR	812 6.0 Cy	827 6.0 Ah	841 5.8 Me
851 8.9 Pt	828 9.1 Ht	*153654*	812 5.9 Me	827 6.0 Jo	842 6.0 Me
S SER	X LIB	772 12.6 Ht	812 6.0 Pt	828 6.0 We	842 5.8 Ko
151714	*153020*	780 12.8 Ht	812 5.9 Ko	828 6.3 Mc	842 6.0 Cy
805 13.4 L	805 11.1 L	799 11.9 Ht	812 6.0 Mn	828 6.0 Mn	842 5.8 Pt
822 13.2 Bw	805 10.8 Bl	800 11.5 En	812 6.0 L	829 6.2 Mc	842 6.0 Cn
838 12.8 L	814 11.4 Wi	807 11.8 Ht	813 6.0 Hf	829 6.0 Me	842 6.0 Sn
851 12.8 Bw	818 10.9 Bl	814 11.8 Ht	813 6.1 Wd	829 6.0 Pt	843 5.9 Ko
858 12.7 Bw	825 11.7 L	823 10.8 Ht	813 6.1 Sz	829 6.0 Sn	843 5.9 Cy
S CRB	827 12.1 Bl	828 10.5 Ht	813 6.1 Sh	829 5.9 Cy	843 6.0 He
151731	839 12.3 L	Z LIB	813 5.9 Ko	829 6.5 Je	843 5.6 Pt
785 10.2 Ch		*154020*	813 6.0 Cy	829 6.0 He	844 5.6 Pt
793 11.1 Ch		805 11.8 Bl	814 5.9 Cy	830 6.1 Wd	844 6.0 Sh

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
R CrB	R CrB	X CrB	RR Lib	U Ser	SX Her
154428	154428	154536	*155018*	160210	160325
844 6.0 L	858 5.9 Pt	861 10.5 Bw	805 11.6 L	869 8.4 Pc	851 8.0 Me
844 6.0 Wd	858 6.0 L	865 10.3 B	825 9.8 L	X Sco	852 8.0 Me
844 6.0 Jo	858 6.0 Sh	866 10.9 Sf	830 9.1 Pt	*160221a*	852 8.0 Pt
844 6.2 Pv	858 5.9 Cy	870 11.1 Bw	840 9.5 L	805 14.0 L	852 8.1 Ko
845 6.0 Oy	858 6.0 Si	R Ser	851 8.6 Pt	814 14.5 Wi	853 8.0 Ko
845 5.6 Pt	858 5.8 Ko	154615	856 8.3 Bw	838[13.3 L	854 8.1 Ko
846 5.6 Pt	858 6.0 Me	802 9.2 Ch	863 8.2 Bw	SX Her	855 8.0 Pt
846 5.8 Ko	859 6.1 Me	808 10.2 Md	Z CrB	160325	856 8.2 Pt
847 5.9 Ko	859 5.8 Ko	812 9.5 Cy	155229	799 8.0 Ko	856 8.0 Me
847 5.9 Cy	859 5.9 Cy	821 10.1 Cy	805 14.2 L	801 7.9 Ko	856 8.1 Ko
847 5.6 Pt	859 6.0 Wd	826 11.0 Cy	838 14.5 L	804 7.9 Ko	857 8.1 Pt
847 6.0 L	860 6.0 Hf	826 11.0 Md	RZ Sco	805 7.8 L	857 8.0 Me
848 6.0 L	861 6.0 Pt	830 10.9 Jo	*155823*	810 7.9 Me	858 8.3 Me
848 6.0 Sh	862 5.9 Pt	830 10.3 Pt	772 8.6 Ht	811 8.0 Me	859 8.3 Me
848 6.2 Ah	862 5.9 Mc	834 11.2 Md	780 8.9 Ht	811 8.1 Pt	861 8.1 Pt
848 6.1 Wd	862 6.1 Me	836 11.4 Ch	786 9.2 Ht	812 8.0 Pt	862 8.1 Pt
848 5.9 Cy	862 6.0 Mg	942 11.4 Cy	799 10.0 Ht	812 7.9 Ko	862 8.0 Me
848 5.9 Ko	863 5.9 Me	851 11.3 Pt	802 10.4 En	812 8.0 Me	863 8.4 Me
848 6.0 Oy	863 6.0 Jo	852 12.3 Cy	807 11.0 Ht	813 7.8 Ko	863 8.3 Pt
849 5.6 Pt	863 5.8 Pt	859 12.3 Cy	814 11.4 Wi	815 7.8 Ko	865 8.1 Me
849 5.8 Me	864 6.0 Pc	865 12.7 B	825 12.2 Ht	815 8.0 Pt	866 8.7 Me
850 6.0 Jo	864 5.8 Ad	V CrB	830 12.5 Pt	817 7.8 Ko	866 8.3 Pt
850 5.8 Ko	865 5.9 Me	154639	851[11.9 Pt	819 7.9 Pt	867 8.3 Pt
850 5.9 Cy	865 6.1 Mg	799 9.0 Jo	Z Sco	820 7.8 Ko	867 8.3 Me
850 5.9 He	865 6.0 Pt	808 10.9 Md	*160021*	823 7.9 L	868 8.4 Me
850 6.1 Wd	866 6.0 Pt	812 10.7 Cy	772[12.2 Ht	824 7.6 Ko	868 8.3 Pt
850 5.9 L	866 5.9 Me	819 10.8 Md	780[12.2 Ht	824 7.9 Me	869 8.1 Pt
850 5.6 Pt	866 6.0 Fd	821 9.0 Jo	799[12.2 Ht	825 7.6 Ko	869 8.7 Me
850 6.0 Me	867 6.0 Me	822 10.6 Bw	805 12.2 En	826 8.1 Pt	870 8.0 Me
851 6.0 Me	867 5.9 Pt	828 10.9 Th	805 11.8 Bl	827 7.7 Ko	871 8.8 Me
851 5.8 Ko	867 5.9 Pc	830 10.0 Pt	807 11.8 Ht	829 8.0 Me	W Sco
851 5.9 Cy	867 6.1 Ad	830 11.3 Ch	810 11.8 L	830 8.0 Pt	*160519*
851 6.1 Si	868 6.0 Pc	832 11.2 Sn	814 11.2 Wi	832 7.9 Sn	805 11.9 Bl
851 5.9 Mc	868 6.0 Hf	833 10.3 B	818 11.5 Bl	833 8.0 Pt	814 12.9 Wi
851 6.0 He	868 5.7 Pt	833 10.7 Md	825 11.4 Ht	833 8.0 Me	RU Her
851 5.9 Ad	868 5.9 Me	833 10.6 Th	825 11.4 L	834 8.0 Pt	160625
851 6.0 Hf	869 6.0 Me	833 11.3 Wi	840 11.1 L	836 8.0 Pt	805 13.2 L
851 5.8 Pt	869 5.7 Pt	841 10.5 Th	852 9.8 Jo	836 7.9 Me	820 11.6 Jo
852 5.9 Pt	869 6.0 Pt	851 10.2 Cy	R Her	839 8.0 Me	821 11.4 Jo
852 6.0 Hf	870 5.8 Me	851 9.2 Bf	160118	940 8.0 Me	823 13.2 L
852 5.9 Ko	870 6.0 Mg	851 9.2 Bc	856[14.2 Bw	840 7.7 L	825 11.0 Jo
852 5.8 Me	871 6.0 Me	851 9.1 Pt	862[14.0 B	841 7.9 Ko	827 11.0 Jo
853 5.9 Ko	X CrB	852 10.1 B	865[14.2 Bw	841 8.0 Me	834 12.7 Pt
853 5.9 Cy	154536	852 10.6 Bw	U Ser	842 8.2 Me	835 12.6 Ch
853 5.9 GD	805 9.5 L	861 10.2 Bw	160210	842 7.9 Pt	836 12.9 Me
854 6.2 We	811 9.2 Me	865 9.9 Me	804 10.1 Cy	843 8.2 Pt	840 12.7 L
854 5.8 Ko	812 9.3 Cy	870 10.0 Bw	810 8.9 Me	843 7.8 Ko	843 12.0 Ko
855 6.2 Ah	825 9.2 L	R Lib	811 9.2 Cy	844 8.1 Pt	848 12.9 L
855 6.0 Pt	826 9.3 Cy	*154715*	815 8.7 Wa	845 8.0 Pt	849 12.2 Me
856 6.0 Pt	827 9.4 Hi	835[13.0 Ch	821 8.8 Cy	846 8.0 Pt	850 12.4 Me
856 5.9 Mc	830 9.1 Ch	856[13.9 Bw	825 7.7 Cy	846 8.0 Ko	850 12.3 Ko
856 6.5 Je	830 9.3 Pt	863[13.5 Bw	826 7.8 We	847 8.0 Pt	851 12.5 Cy
856 6.0 He	835 9.5 B	R Lup	827 7.6 My	848 7.9 L	851 12.5 Pt
856 5.8 Ko	842 9.6 L	*154736*	830 7.8 Pt	849 8.0 Me	852 11.3 Jo
856 5.8 Me	848 9.7 L	802[12.0 En	830 7.5 Jo	850 8.0 Me	858 12.7 Bw
857 5.7 Me	852 10.0 Hi	810[13.0 Sl	851 8.4 Pt	850 7.9 Ko	870 12.5 Bw
857 5.8 Ko	853 9.8 Cy		851 7.8 Hl	851 7.9 Ko	
857 5.9 Pt	857 10.4 Sf		866 8.3 Fd	851 8.0 Pt	

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.
R Sco		**U Her**		**T Oph**		**W Her**		**R Dra**		**S Her**	
161122a		162119		*162815*		163137		163266		164715	
772	10.2 Ht	799	10.0 Jo	805	9.8 Bl	866	8.4 Bw	842	8.4 Rn	850	8.8 Jo
780	10.0 Ht	801	10.1 Ah	815	9.8 Pt	866	8.5 Sf	842	8.3 Sn	856	9.4 Pt
786	10.2 Ht	802	10.0 Ch	825	10.6 L	**R UMi**		844	8.3 Jo	858	9.0 Jo
799	11.5 Ht	812	10.2 Cy	836	11.2 Ch	163172		844	8.4 Wd	861	9.2 Jo
805	11.8 Bl	814	10.2 Jo	840	11.4 L	799	8.7 Jo	848	9.1 Wd	861	9.6 Bw
805	11.9 En	815	10.0 Pt	852	11.5 Pt	806	9.2 L	848	8.3 Jo	865	9.7 Me
807	11.7 Ht	817	10.2 Jo	861	11.8 Bw	810	9.0 Jo	849	8.6 Mn	868	9.5 Pc
815	11.8 Pt	820	10.5 Jo	870	11.9 Bw	812	9.5 Me	850	9.2 Wd	870	9.9 Bw
825	12.3 Ht	822	10.4 Jo	**S Oph**		814	9.0 Jo	852	9.1 Wd	**RS Sco**	
866	[13.7 Bw	824	10.8 Me	*162816*		817	9.0 Jo	852	9.0 Hf	*164844*	
867	[13.4 Bg	824	11.0 Ch	805	10.5 L	819	8.9 Jo	852	9.3 Pt	772	6.9 Ht
S Sco		825	10.5 Jo	805	10.6 Bl	822	9.3 Jo	852	8.5 Jo	780	6.5 Ht
161122b		826	11.0 Sf	825	10.1 L	827	9.0 Jo	855	9.4 Ah	786	6.3 Ht
772	[12.6 Ht	827	10.5 Jo	836	10.0 Ch	832	9.2 Sn	856	9.1 Mn	792	6.3 Bl
805	[13.4 Bl	830	10.7 Jo	840	10.2 L	839	9.2 Me	858	8.4 We	799	6.9 Ht
825	11.5 Ht	831	11.4 Cy	865	11.3 B	842	9.1 L	859	9.6 Wd	802	7.2 En
850	10.5 Me	832	11.0 Sn	870	11.8 Bw	844	8.9 Jo	861	9.5 Jo	805	7.2 Bl
852	10.4 Jo	833	9.2 Sh	**W Her**		848	9.0 Jo	863	10.2 Hf	807	6.9 Ht
852	11.2 Pt	838	9.3 Sh	163237		852	9.0 Jo	863	10.1 Wd	814	7.2 Ht
858	11.0 Jo	843	11.4 Cy	799	10.3 Jo	861	9.0 Jo	866	10.1 Fd	818	7.0 Bl
863	11.3 Jo	848	11.5 Jo	801	10.6 Ko	**R Dra**		868	10.0 Pc	825	7.5 Ht
866	11.6 Bw	852	11.9 Pt	802	10.5 Ch	163266		**RR Oph**		**RR Sco**	
867	11.2 Bg	853	11.5 Cy	812	9.7 Ko	792	7.6 Ch	*164319*		*165030a*	
W CrB		859	11.4 Cy	814	8.7 Jo	799	7.4 Jo	801	9.3 Ko	772	7.9 Ht
161138		866	11.8 Fd	815	9.2 Ko	801	7.7 Ah	806	9.7 L	780	8.4 Ht
799	8.6 Jo	**SS Her**		815	9.5 Pt	802	7.3 Mn	813	9.5 Ko	786	9.1 Ht
815	9.5 Pt	162807		817	9.2 Ko	807	7.6 Mn	815	9.0 Pt	799	9.5 Ht
819	9.6 Md	804	11.2 Cy	817	9.0 Jo	808	7.6 Ah	825	9.7 L	803	9.2 Sl
820	9.7 Jo	805	11.4 L	820	8.7 Jo	810	7.5 Jo	827	9.8 Ko	805	10.2 En
822	9.8 Jo	812	10.1 Me	820	8.9 Ko	810	7.2 Ad	832	10.0 Sn	807	10.6 Ht
825	10.5 Jo	812	10.3 Cy	822	8.6 Jo	811	7.5 Ah	842	10.0 Rn	809	9.4 Sl
827	11.0 Jo	815	10.3 Pt	824	8.7 Ko	812	7.5 Me	842	9.9 Sn	814	10.6 Ht
830	10.8 Jo	821	8.8 Jo	824	8.9 Me	813	7.2 Hf	842	10.0 L	818	10.8 Bl
832	11.0 Sn	823	9.3 L	825	8.6 Ko	813	7.5 Wd	843	10.1 Ko	825	10.8 Ht
834	10.6 Md	825	8.9 Jo	825	8.7 Jo	814	7.5 Jo	852	10.4 Ko	**SS Oph**	
835	10.9 B	825	9.1 Cy	826	9.0 Sf	814	7.3 Ad	856	10.3 Pt	*165202*	
851	11.3 Bw	831	9.0 Cy	827	8.6 Ko	815	7.5 Pt	869	11.0 Pc	815	12.2 Pt
852	11.0 Pt	832	8.8 Sn	827	8.7 Jo	816	7.5 Wd	**S Her**		836	10.2 Ch
865	12.0 B	833	8.8 Th	828	8.6 Th	817	7.5 Jo	164715		858	8.6 Pt
866	12.3 Bw	836	8.8 Th	831	9.0 Sf	820	7.7 Wd	799	7.7 Jo	**RV Her**	
W Oph		836	9.1 Ch	833	8.4 Th	821	7.9 Gy	801	7.7 Ah	165631	
161607		840	9.1 L	836	8.4 Th	821	7.6 Sn	808	7.6 Ah	811	14.3 L
811	11.2 L	843	8.9 Th	836	8.5 Ch	822	7.6 Jo	810	7.0 Ad	830	12.6 Ch
815	11.5 Pt	843	9.2 Cy	841	8.5 Th	825	7.9 Mn	814	7.2 Ad	834	12.0 Md
838	12.1 L	848	9.2 L	841	8.2 Ko	825	7.4 Ad	814	7.7 Jo	840	11.9 L
852	12.2 Pt	850	9.2 Jo	843	8.5 Th	827	7.8 Jo	815	8.1 Pt	849	10.7 Wi
V Oph		850	9.7 Sf	846	8.5 Ko	827	7.9 Ah	820	7.6 Jo	850	10.1 L
162112		851	9.5 Bc	847	8.4 Th	828	8.0 Mn	822	8.1 Jo	856	9.8 Pt
811	9.1 L	851	9.5 Bf	848	8.7 Jo	829	7.9 Sn	823	8.1 Ws	862	10.2 B
815	8.5 Pt	852	10.0 Pt	848	8.4 Sf	830	8.2 Sh	825	8.0 Jo	865	9.9 Bw
836	8.8 Ch	854	9.9 Sf	851	8.4 Ko	830	8.1 Wd	825	7.3 Ad	867	10.1 Me
838	8.2 L	858	10.2 Sf	852	8.3 Jo	830	8.1 Mn	827	8.2 Jo	**RT Sco**	
850	8.0 L	861	10.0 Jo	852	8.5 Pt	832	7.5 Ad	827	7.9 Ah	*165636*	
852	8.3 Pt	865	10.8 B	854	8.6 Sf	835	8.2 Mn	827	8.2 My	818	[12.1 Bl
852	7.8 Jo	866	10.7 Sf	857	8.7 Hl	835	8.0 Sn	830	8.3 Jo	**R Oph**	
858	7.8 Jo	**T Oph**		859	8.5 Sf	836	8.1 Ch	832	8.3 Sn	*170215*	
861	7.7 Jo	*162815*		865	8.7 B	838	8.3 Wd	832	7.5 Ad	806	11.9 L
		805	9.9 L	866	8.7 Fd	839	8.3 Me	836	8.5 Ch	840	12.7 L

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
R OPH	S OCT	RY HER	W DRA	T SER	R SCT
170215	*172486*	175519	180565	182306	*184205*
869 13.5 Pc	818 10.6 Bl	856 10.1 Pt	856 10.0 Pt	852 10.0 Jo	809 5.1 Sl
RT HER	825 11.4 Ht	862 10.3 B	858 9.9 L	856 11.0 Pt	811 5.6 Me
170627	RU OPH	V DRA	X DRA	863 10.0 Jo	811 5.1 Cy
843 12.6 Ko	172809	175654	180666	SV DRA	812 5.1 Cy
849 12.2 Wi	810 14.1 L	806 13.9 L	813 13.9 Wi	183149	812 5.6 Pt
851 12.0 Ko	815 13.6 Pt	813 13.2 Wi	856[12.0 Pt	806 11.9 L	824 5.5 Me
856 11.8 Pt	836 11.7 Ch	840 11.9 L	TV HER	813 11.0 Wi	825 5.5 Me
857 11.7 Ko	840 12.9 L	856 12.0 Pt	181031	840 9.6 L	825 5.1 L
861 10.7 Jo	850 11.9 L	858 11.6 L	806[14.1 L	RZ HER	829 5.5 Me
862 11.4 B	856 11.8 Pt	R PAV	840[14.1 L	183225	830 5.1 Cy
863 10.5 Jo	867 11.3 Me	*180363*	RY OPH	806 11.7 L	831 5.5 Me
865 10.9 Bw	RT SER	772 11.6 Ht	181103	840 13.1 L	832 5.3 Cy
866 10.7 Bw	*173411*	780 11.0 Ht	785 13.1 Sl	X OPH	832 5.1 Ad
RW SCO	806 12.7 L	786 10.5 Ht	809 11.6 Sl	183308	832 5.2 Sn
170833	840 12.5 L	799 9.5 Ht	832 8.9 Sn	799 6.8 Ko	833 5.7 Pt
805[12.5 En	RU SCO	807 9.1 Ht	833 8.5 Pt	801 6.8 Ko	835 5.3 Sn
818[12.5 Bl	173543	814 8.3 Ht	842 8.1 Rn	809 6.8 L	836 5.8 Me
α HER	805[12.4 En	825 7.9 Ht	842 8.2 Sn	810 6.7 Ch	836 5.8 Pt
171114	818[11.8 Bl	T HER	855 8.6 Ah	810 7.5 Jo	838 5.3 L
806 3.9 We	W PAV	180531	856 8.4 Pt	813 6.8 Ko	839 5.7 Me
808 3.9 We	*174162*	799 11.4 Jo	W LYR	814 7.3 Jo	840 5.6 Me
826 3.3 We	772 8.5 Ht	801 10.8 Ah	181136	814 7.1 Ad	840 5.6 Pt
828 3.2 Mc	780 8.5 Ht	807 9.7 Ch	799 8.9 Jo	822 6.8 Jo	841 5.6 Me
831 2.9 Mc	786 8.5 Ht	808 9.7 Ah	801 9.3 Ah	827 6.7 Ko	842 5.6 Me
831 3.3 We	792 8.3 Bl	811 9.1 L	808 9.4 Ah	832 6.8 Sn	842 5.7 Pt
845 3.3 Oy	799 8.4 Ht	814 8.1 Jo	810 9.4 Jo	832 6.9 Ad	842 5.2 Cy
858 3.7 We	807 8.6 Ht	815 8.6 Pt	811 9.5 L	833 6.8 Pt	843 5.6 Pt
Z OPH	814 8.8 Ht	820 7.8 Jo	811 9.9 GD	840 6.9 L	845 5.5 Pt
171401	818 9.5 Bl	823 8.1 L	813 9.7 Wi	842 6.8 Sn	846 5.3 Pt
815 12.5 Pt	825 9.8 Ht	824 7.8 Me	813 10.0 Hf	843 6.7 Ko	847 5.2 Cy
841 8.8 Th	RS OPH	825 7.4 Ad	813 9.9 Wd	848 7.1 Jo	848 5.2 Cy
856 10.0 Pt	*174406*	827 7.7 Jo	816 10.0 Wd	850 7.0 Jo	848 5.2 L
866 9.4 Fd	856 11.1 Pt	827 7.8 Ah	821 10.5 Jo	850 6.9 L	849 5.4 Me
867 9.4 Mc	U ARA	830 7.8 Ch	825 10.5 Jo	851 7.1 Ad	850 5.5 Jo
869 8.9 Pc	*174551*	832 7.4 Ad	827 10.9 Ah	851 6.9 Ko	850 5.2 Cy
RS HER	772 8.1 Ht	838 7.9 Cn	827 12.4 Jo	851 8.6 Si	850 5.5 We
171723	780 8.1 Ht	842 8.0 We	829 11.6 Sn	856 7.3 Pt	850 5.3 Pt
799 11.7 Jo	786 8.3 Ht	842 8.3 L	830 11.1 Pt	858 7.4 We	850 5.5 Me
814 11.9 Jo	799 8.6 Ht	843 8.0 He	830 11.1 Wd	861 7.3 Jo	851 5.5 Me
815 12.2 Pt	807 9.3 Ht	848 7.8 Jo	835 11.7 Sn	863 7.6 Jo	851 5.8 Pt
820 12.0 Jo	814 9.9 Ht	849 8.2 Me	838 11.4 Wd	864 7.3 Ad	851 5.3 Ad
822 12.5 Jo	825 10.4 Ht	850 7.8 Jo	840 12.0 L	870 7.7 Me	852 5.5 Pt
851 11.5 Jo	RT OPH	850 7.8 We	851 12.0 Jo	RY LYR	852 5.4 Jo
856 12.0 Pt	175111	850 8.2 L	856 12.7 Pt	184134	852 5.9 Wd
863 11.0 Jo	836 11.7 Ch	851 7.5 Ad	858 12.6 L	806 11.4 L	852 5.6 Me
870 10.2 Bw	849 10.5 Wi	852 7.9 Jo	863 12.0 Jo	813 11.1 Wi	852 5.9 Sh
S OCT	856 10.2 Pt	856 8.5 Pt	866 12.5 Bg	830 12.0 Pt	852 5.9 Hf
172486	862 9.8 B	857 8.1 Je	SV HER	840 12.1 L	853 5.4 Ad
771 8.4 En	RY HER	858 8.5 GD	182224	856 12.5 Pt	853 5.3 Cy
772 8.8 Ht	175519	861 8.5 Jo	811 11.8 L	R SCT	856 5.4 Mc
780 8.7 Ht	807 8.8 Ch	863 8.6 Jo	825 12.8 L	*184205*	856 5.7 Me
785 9.1 Sl	810 8.9 L	864 7.6 Ad	858 13.6 L	677 5.8 Si	856 6.0 Pt
786 9.2 Ht	815 8.9 Pt	866 8.8 Fd	T SER	780 6.2 Ch	857 5.8 Pt
792 9.3 Bl	825 8.9 L	868 8.9 Pc	182306	785 5.9 Sl	857 5.6 Me
799 10.0 Ht	826 9.2 Md	W DRA	822 9.6 Jo	803 5.1 Cy	858 5.6 Me
806 9.9 Sl	830 8.6 Ch	180565	825 9.5 Jo	804 5.1 Cy	858 6.0 GD
807 10.3 Ht	842 9.1 L	806 14.1 L	833 11.1 Pt	806 5.0 L	
814 10.6 Ht	848 9.8 L	840 11.4 L	850 10.1 Jo	807 5.5 Ch	

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
R SCT	S CRA	V LYR	U DRA	RY SGR	R CYG
184205	*185437a*	190529a	190967	*191033*	193449
858 5.8 Pt	772 11.6 Ht	849[14.1 Wi	856 10.3 Pt	850 7.6 L	677 7.6 Si
859 5.3 Cy	785 12.1 Sl	856[12.3 Pt	858 10.6 L	856 7.6 Pt	698 8.2 Si
859 5.6 Me	801 12.1 Ht	RX SGR	858 10.4 Sf	857 7.6 Pt	780 11.8 Ch
861 5.8 Pt	807 11.9 Ht	*190818*	866 10.2 Sf	861 7.0 Pt	812 12.5 Pt
862 5.7 Mg	809 11.7 Sl	772 9.9 Ht	869 10.7 Me	862 7.1 Pt	842 12.6 Pt
862 5.9 Mc	825 12.1 Ht	780 10.0 Ch	W AQL	866 7.5 Pt	866[12.4 Fd
863 5.7 Pt	R CRA	801 10.0 Ht	*191007*	867 7.5 Pt	RV AQL
863 5.4 Jo	*185537a*	807 10.2 Ht	811 8.6 L	868 7.5 Pt	193509
863 5.6 Me	772 11.8 Ht	811 10.3 L	833 8.5 Pt	S SGR	807 13.7 L
863 5.8 Hf	785 11.4 Sl	825 10.8 Ht	840 8.5 L	*191319a*	825 12.0 L
863 5.9 Wd	801 11.5 Ht	833 11.0 Pt	840 8.7 Me	772[12.2 Ht	842 11.1 L
864 5.2 Ad	807 11.5 Ht	838 11.0 L	848 8.6 L	807[12.2 Ht	842 11.7 Pt
865 6.0 GD	809 11.4 Sl	848 11.6 L	856 8.7 Pt	825[12.2 Ht	850 10.5 L
866 5.9 Pt	825 12.3 Ht	856 11.6 Pt	869 9.2 Pc	841 13.1 L	T PAV
866 5.6 Fd	T CRA	RW SGR	T SGR	856 11.8 Pt	*193972*
866 5.8 Me	*185537b*	*190819a*	*191017*	869 11.5 Me	772 10.5 Ht
867 5.9 Me	772[12.5 Ht	772 10.9 Ht	780 9.5 Ch	869 11.8 Pc	773 10.7 Bl
867 5.6 Pc	785 13.1 Sl	780 10.8 Ch	833 10.5 Pt	Z SGR	780 11.2 Ht
867 5.7 Pt	801[12.5 Ht	801 9.9 Ht	856 11.4 Pt	*191321*	784 11.4 Bl
868 5.9 Pt	809[12.5 Sl	807 9.9 Ht	869 11.5 Pc	841[13.8 L	792 11.7 Bl
868 5.9 Me	825 12.5 Ht	811 9.9 L	R SGR	TZ CYG	799 11.9 Ht
869 5.9 Me	Z LYR	814 9.9 Wi	*191019*	191350	807 12.4 Ht
869 6.0 GD	185634	825 9.6 Ht	772 9.0 Ht	830 10.1 Pt	RT CYG
869 5.7 Pc	806 10.4 L	833 9.5 Pt	801 11.5 Ht	856 10.1 Pt	194048
869 5.6 Fd	814 10.5 Wi	838 9.3 L	806 11.8 L	U LYR	780 10.8 Ch
870 5.8 Mg	825 11.2 L	848 9.3 L	807 11.4 Ht	191637	808 12.2 Ah
870 5.8 Me	830 10.6 Pt	856 9.3 Pt	815 11.7 Wi	830 12.0 Pt	810 12.2 Jo
871 6.0 Me	842 11.4 L	TY AQL	825 11.4 Ht	835 11.9 Sn	812 11.6 Pt
RW LYR	856 11.9 Pt	*190907*	833 12.5 Pt	840 12.2 Jo	821 12.3 Jo
194243	858 12.0 L	833 10.6 Pt	840 13.0 L	851 12.0 Jo	822 12.5 Jo
814 15.6 Wi	SU SGR	840 10.4 Me	856 10.8 Pt	856 12.0 Pt	824 10.3 Mc
Nov AQL	*185722*	856 10.8 Pt	869 12.0 Pc	858 12.4 Jo	838 10.0 Wd
184300	772 8.8 Ht	869 10.6 Pc	RY SGR	866[11.7 Fd	840 9.8 Jo
812 11.6 Pt	801 8.8 Ht	S LYR	*191033*	AF CYG	842 9.0 Pt
833 11.8 Pt	807 8.5 Ht	190925	772 8.1 Ht	192745	848 9.3 Wd
835 10.9 Sn	825 8.4 Ht	806 12.6 L	780 8.0 Ch	801 7.5 Ah	850 9.4 Wd
842 11.8 Pt	RT LYR	841 13.7 L	786 7.9 Ht	808 7.7 Ah	850 9.6 Jo
851 11.8 Pt	185737	856[12.3 Pt	800 7.7 En	827 7.5 Ah	852 9.2 Jo
852 10.8 Jo	806 13.5 L	X LYR	801 7.9 Ht	848 7.2 Ah	855 9.2 Ah
861 11.0 Jo	814 13.5 Wi	190926	805 8.1 L	855 6.9 Ah	858 9.0 Jo
864 10.8 Pc	840[13.9 L	833 9.1 Pt	805 7.9 Bl	TY CYG	859 9.2 Wd
866 11.7 Pt	R AQL	856 9.0 Pt	806 8.2 L	192928	861 9.0 Jo
RX LYR	190108	RS LYR	807 7.8 Ch	810 10.2 L	863 8.5 Jo
185032	801 10.9 Ko	190933a	807 7.8 Ht	840 10.3 L	864 7.5 Ad
813 15.5 Wi	807 10.8 Ch	806 13.7 L	809 8.0 Sl	856 10.8 Pt	866 8.6 Wd
849[14.5 Wi	808 10.8 Ah	814 13.8 Wi	812 8.0 L	858 10.8 L	866 8.4 Fd
856[13.0 Pt	823 9.9 Ws	830 13.6 Pt	812 8.1 Pt	RT AQL	TU CYG
R LYR	827 10.4 Ah	856[12.7 Pt	813 7.7 En	193311	194348
185243	827 10.7 Ko	RU LYR	814 7.8 Ht	806 12.0 L	780 10.0 Ch
826 4.3 We	833 10.3 Pt	190941	825 7.7 Ht	808 12.0 Ah	806 11.6 Ry
829 4.5 Mc	843 9.7 Ko	814 13.0 Wi	825 7.8 L	825 11.1 L	807 11.5 L
845 4.2 Oy	855 9.5 Ah	856[12.7 Pt	833 7.9 Pt	833 10.8 Pt	812 11.7 Pt
	856 8.6 Pt	U DRA	838 7.7 L	842 9.6 L	821 12.0 Ry
856 4.3 Mc	863 8.5 Jo	190967	840 8.0 Pt	848 8.6 L	825 12.8 Ry
	865 8.6 Ko	806 12.2 L	841 7.8 L	855 8.8 Ah	828 13.2 Ry
862 4.1 Mc	869 8.5 Pc	830 11.9 Pt	842 8.0 Pt	856 8.2 Pt	834 13.0 Ry
		840 11.3 L	845 7.9 Pt		840 13.0 L
		852 10.4 Sf	848 7.5 L		842 12.9 Pt

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
TU CYG	S TEL	R SGE	RS CYG	U CYG	ST CYG
194348	*195855*	200916	200938	201647	202954
858 14.0 L	801 12.7 Ht	814 9.7 Jo	869 7.9 Hf	820 7.7 Jo	840 10.9 L
X AQL	807[12.6 Ht	822 9.7 Jo	R DEL	822 7.6 Jo	861 11.5 Pt
194604	825[12.6 Ht	824 9.2 Me	201008	824 7.7 Mc	V VUL
841 13.8 L	SY AQL	831 9.5 Me	811 13.1 L	825 7.6 GD	*203226*
849 13.6 Wi	200212	840 9.7 Me	812 13.9 Pt	825 7.1 Ad	812 8.7 Pt
858 13.6 L	807 13.1 L	850 9.6 Me	840 12.8 L	826 8.0 Mn	861 9.0 Pt
867 13.0 Pc	812 13.5 Pt	850 10.0 Jo	861 12.7 Pt	827 7.6 Jo	Y DEL
χ CYG	840 14.0 L	861 9.3 Jo	SX CYG	827 7.5 Ah	*203611*
194632	842[13.2 Pt	863 9.2 Jo	201130	828 7.8 Mc	810 12.0 L
677 7.8 Si	S CYG	866 9.5 Me	804 9.8 Cy	829 7.8 Mc	841 12.8 L
702 9.1 Si	*200357*	RS CYG	812 9.5 Pt	830 8.0 Mn	S DEL
812 12.7 Pt	842[12.4 Pt	200938	820 9.6 Cy	832 7.0 Ad	*203816*
842 13.3 Pt	859[11.4 Wd	677 8.2 Si	830 9.6 Cy	833 8.0 Mn	812 9.4 Pt
866 13.5 Bg	R CAP	698 7.8 Si	843 9.8 Cy	839 7.7 GD	861 11.7 Pt
867 13.1 Pc	*200514*	780 7.2 Ch	848 9.8 Cy	842 7.4 We	V CYG
RU SGR	811[13.1 L	803 7.5 Cy	859 10.2 Cy	849 8.2 Mn	*203847*
195142	841 14.1 L	807 7.2 L	861 10.3 Pt	849 7.7 GD	810 12.2 L
772 7.6 Ht	842[12.8 Pt	810 7.2 Ch	WX CYG	850 7.7 Jo	812 13.0 Pt
786 7.6 Ht	S AQL	810 7.4 Jo	201437b	850 7.7 Wd	830 12.9 Ma
801 8.3 Ht	*200715a*	811 7.4 Cy	803 11.4 Cy	851 8.2 Mc	841 13.2 L
807 8.5 Ht	810 11.6 Ch	812 7.0 Pt	807 11.3 L	851 7.2 Ad	861 12.7 Pt
814 9.1 Ht	810 10.8 Jo	820 7.3 Jo	810 11.3 Ch	852 7.7 Wd	869 13.2 Pc
825 10.5 Ht	812 10.5 Pt	820 7.5 Cy	810 11.8 Jo	852 7.7 Sh	Y AQR
RR AQL	822 9.5 Jo	822 7.3 Jo	811 11.4 Cy	852 7.7 Jo	*203905*
195202	824 9.5 Me	823 7.2 L	812 11.0 Pt	852 7.7 Hf	861[12.3 Pt
807 11.0 L	831 9.4 Me	825 7.2 GD	820 10.8 Jo	853 7.8 GD	T DEL
840 11.5 L	840 9.0 Me	825 7.5 Cy	820 11.3 Cy	856 8.6 Mn	*204016*
RS AQL	842 9.3 Pt	829 7.2 GD	822 10.5 Jo	856 8.3 Mc	810 13.0 L
195308	850 9.0 Me	836 7.6 Ch	823 10.8 L	858 7.8 Je	812 12.8 Pt
811[13.8 L	850 9.4 Jo	839 7.1 GD	830 11.0 Cy	858 7.6 Jo	841 14.5 L
842[14.3 L	861 9.0 Jo	840 7.7 Me	842 11.1 Cy	858 7.9 GD	861[12.9 Pt
NOV CYG	863 9.0 Jo	842 7.2 L	842 10.5 L	859 7.9 Wd	V AQR
195553	867 8.9 Bg	848 7.2 Jo	848 10.9 Jo	861 7.7 Jo	204102
811[12.2 Pt	RW AQL	849 7.2 GD	850 10.7 Jo	861 7.7 Pt	810 8.9 L
826[12.2 Pt	*200715b*	850 7.3 Jo	850 11.0 Cy	862 8.4 Mc	812 8.7 Pt
842[12.2 Pt	810 9.9 Jo	850 7.6 Wd	852 10.9 Jo	863 7.8 Jo	841 8.2 L
851[12.2 Pt	812 9.3 Pt	850 7.5 Me	858 10.6 Jo	863 7.9 Wd	850 8.1 L
863[12.2 Pt	822 9.8 Jo	851 7.8 Si	859 11.0 Cy	863 7.8 Hf	W AQR
RR TEL	842 9.3 Pt	851 7.4 Ad	861 10.3 Jo	864 7.0 Ad	*204104*
195656	850 9.8 Jo	852 7.2 Jo	861 11.5 Pt	865 7.7 GD	811 11.9 L
772[12.6 Ht	861 9.9 Jo	852 7.7 Wd	862 10.5 Jo	865 7.9 Sh	841 11.8 L
801[12.6 Ht	863 9.4 Jo	852 7.7 Hf	866 10.8 Bg	866 8.0 Wd	U CAP
807[12.6 Ht	867 9.1 Bg	852 7.7 Sh	V SGE	866 8.3 Sf	*204215*
825[12.6 Ht	RU AQL	853 7.5 GD	201520	866 7.4 Fd	811[13.5 L
Z CYG	*200812*	857 7.2 Je	840 11.9 Me	867 8.2 Wd	841 14.2 L
195849	807 9.3 L	858 7.4 Jo	869 11.6 Me	867 8.0 Sh	V DEL
807 13.3 L	825 9.7 L	858 7.2 GD	870 11.6 Me	869 8.2 Hf	*204318*
812 12.2 Pt	842 10.7 L	859 7.5 Wd	U CYG	Z DEL	811 13.3 L
840 11.1 L	W CAP	861 7.2 Pt	201647	202817	830 14.0 Ma
842 10.8 Pt	*200822*	861 7.3 Jo	731 7.1 Si	807 9.7 L	841 13.7 L
852 9.6 Jo	842[12.5 Pt	863 7.2 Jo	780 7.2 Ch	812 9.4 Pt	T AQR
858 9.4 Jo	Z AQL	863 7.8 Wd	799 7.4 Jo	840 10.1 L	*204305*
861 9.0 Jo	*200906*	863 7.8 Hf	801 7.3 Ah	861 11.4 Pt	780 8.1 Ch
863 9.1 Jo	812 11.0 Pt	864 7.3 Ad	808 7.5 Ah	ST CYG	805 7.6 Ch
867 9.1 Me	861 13.5 Pt	866 7.6 Wd	812 7.0 Pt	202954	812 7.2 Pt
S TEL	869[12.0 Me	867 7.8 Hf	813 7.6 Hf	807 10.3 L	861 9.6 Pt
195855		867 7.8 Sh	813 7.7 Wd	812 10.1 Pt	
772[12.6 Ht		867 7.7 Wd	814 7.2 Ad	827 10.9 My	

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs.

RZ CYG
204846
812 10.8 Pt
861 12.3 Pt
S IND
204954
772[13.1 Ht
801[13.1 Ht
807[13.1 Ht
825[13.1 Ht
X DEL
205017
810[13.6 L
841 13.4 L
861 12.1 Pt
T OCT
205782
806 9.9 Sl
R VUL
205923a
812 12.5 Pt
858 8.6 Jo
861 8.4 Jo
861 7.9 Pt
863 7.9 Jo
V CAP
210124
841 9.7 L
TW CYG
210129
810 11.8 L
841 10.0 L
850 9.7 L
X CAP
210221
862[12.1 Pt
X CEP
210382
705 10.9 Pc
RS AQR
210504
811 13.3 L
841 14.5 L
862[12.9 Pt
Z CAP
210516
841 13.3 L
862 13.3 Pt
R EQU
210812
810 10.8 L
812 10.4 Pt
830 11.7 Ma
841 12.2 L
862 13.2 Pt

T CEP
210868
780 7.1 Ch
798 7.3 Th
799 7.0 Jo
801 7.6 Ah
802 7.6 Mn
805 7.7 Ch
807 7.9 Mn
808 7.9 Ah
812 7.3 Pt
813 8.0 Hf
813 8.1 Wd
819 7.7 Jo
821 8.3 Gy
822 7.5 Jo
825 7.7 Jo
826 8.2 Mn
827 8.1 Ah
828 8.3 Mn
828 8.2 Th
829 7.9 Sn
830 8.2 Sh
830 8.2 Wd
830 8.4 Mn
833 8.6 Th
835 8.6 Mn
835 8.1 Sn
836 8.8 Th
838 8.4 Wd
841 8.8 Th
843 9.0 Th
848 9.0 Wd
849 8.9 Mn
850 8.2 Jo
852 8.5 Jo
855 9.0 Ah
856 9.5 Mn
859 9.3 Wd
861 8.9 Jo
862 8.6 Pt
863 9.0 Jo
866 9.5 Wd
866 9.4 Fd
869 9.4 Fd
RR AQR
210903
811 11.8 L
812 11.6 Pt
841 13.9 L
862[12.9 Pt

Y PAV
211570
772 5.5 Ht
801 5.6 Ht
807 5.4 Ht
825 5.5 Ht
X PEG
211614
810 10.4 L
812 11.1 Pt
830 12.2 Ma
841 13.3 L
862 13.2 Pt
T CAP
211615
811 12.8 L
842 12.2 L
Y CAP
212814
841 13.1 L
W CYG
213244
811 6.1 L
841 6.1 L
856 6.5 Mc
862 6.7 Mc
S CEP
213678
812 9.0 Pt
820 10.7 Cy
832 10.9 Cy
833 10.0 Th
843 11.1 Cy
850 11.1 Cy
850 9.8 Jo
852 10.2 Jo
857 10.5 Je
859 11.0 Cy
861 10.8 Jo
862 11.0 Pt
866 11.5 Fd
RU CYG
213753
808 8.7 Ah
810 9.1 Ry
812 8.6 Pt
821 9.1 Ry
822 8.6 Jo
824 9.1 Ry
825 8.6 Jo
827 8.7 Ah
828 9.0 Ry

RU CYG
213753
834 8.8 Ry
845 8.8 Ry
850 8.8 Me
856 9.4 Mc
861 8.7 Jo
862 9.5 Mc
862 8.6 Pt
863 8.8 Jo
867 8.3 Ry
869 8.4 Ry
RV CYG
213937
812 6.4 Pt
862 6.6 Pt
RR PEG
214024
812 9.2 Pt
862 11.6 Pt
R GRU
214247
828[12.9 Ht
V PEG
215605
862 13.0 Pt
U AQR
215717
862 11.6 Pt
RY PEG
220133a
812 9.8 Pt
RZ PEG
220133b
812 10.7 L
842 8.3 L
862 8.9 Pt
T PEG
220412
811 9.2 L
838 9.6 L
848 9.6 L
Y PEG
220613
862 12.6 Pt
RS PEG
220714
842 13.8 L
862 13.2 Pt
S GRU
221948
828 12.4 Ht
RV PEG
222129
811 10.9 L

RV PEG
222129
842 11.3 L
S LAC
222439
801 8.4 Ko
811 8.2 L
812 8.1 Pt
813 7.8 Ko
825 8.1 L
827 7.9 Ko
842 8.2 L
843 8.4 Ko
862 9.7 Pt
R IND
222867
826 11.6 Bl
828 11.5 Ht
T TUC
223462
828 12.3 Ht
R LAC
223841
811 9.2 L
812 9.0 Pt
842 8.9 L
862 10.0 Pt
869 10.6 Me
RW PEG
225914
811 9.2 L
842 13.8 L
867 13.2 Pt
R PEG
230110
867 10.2 Pt
869 10.8 GD
V CAS
230759
801 11.4 Ko
804 11.3 Cy
812 11.4 Pt
827 11.8 Ko
832 11.1 Cy
843 11.0 Cy
843 12.0 Ko
853 12.7 Cy
867 11.4 Pt
W PEG
231425
811 8.5 L
838 8.5 L
861 9.8 Jo
863 9.7 Jo

S PEG
231508
842 10.8 L
867 11.9 Pt
Z AND
232848
812 10.6 Pt
861 10.5 Jo
863 10.3 Jo
867 10.6 Pt
ST AND
233335
812 8.6 Pt
861 9.1 Jo
863 9.4 Jo
867 8.8 Pt
Z CAS
233956
842 14.0 L
R TUC
235265
770[12.9 En
772[13.0 Ht
780[13.0 Ht
R CAS
235350
779 9.7 Ch
799 6.5 Jo
801 6.4 Ah
802 7.0 Mn
807 6.8 Mn
808 6.4 Ah
810 6.7 Jo
827 6.5 Ah
855 7.0 Ah
858 7.3 Jo
861 7.4 Jo
863 7.4 Jo
Z PEG
235525
812 9.1 L
812 9.0 Pt
841 10.4 L
867 11.6 Pt
Y CAS
235855
806 9.4 L
841 9.5 L
861 10.5 Jo
SV AND
235939
867 12.9 Pt

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

RAPIDLY VARYING IRREGULAR VARIABLES.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
005840 RX ANDROMEDAE—						
	6805.3	[11.3	Ry	6862.9	13.0	Pt
	6827.6	11.4	Ry	6867.9	13.0	Pt
	6842.9	12.9	Pt	6869.8	[12.1	Me
	6843.5	[12.5	Ry	6871.8	11.4	Me
	6861.8	13.1	Pt	6883.8	13.0	Pt
060547 SS AURIGAE—						
	6776.2	[13.2	Ch	6833.6	[12.5	Pt
	6802.5	[12.5	Cy	6834.1	[13.2	Ch
	6803.5	[12.5	Cy	6835.6	[11.2	Cy
	6804.3	14.3	L	6836.7	[12.5	Pt
	6805.3	14.3	L	6838.6	[13.3	Cn
	6806.3	14.3	L	6839.3	[12.4	L
	6807.3	14.4	L	6840.6	[13.0	Mg
	6810.3	14.3	L	6842.3	11.3	L
	6811.8	[11.5	Pt	6844.7	11.2	Pt
	6812.6	[12.0	Pt	6846.3	11.0	L
	6814.6	[12.5	Jo	6847.3	10.9	L
	6815.8	[11.5	Pt	6847.7	10.9	Pt
	6816.6	[12.5	Pt	6848.6	10.9	Cy
	6817.6	[11.0	Pt	6849.6	11.3	Me
	6819.6	[13.0	B	6849.7	11.0	Hi
	6820.5	12.5	Cy	6850.6	11.5	Cy
	6821.6	12.5	Cy	6851.7	12.2	Pt
	6822.6	[13.8	Bw	6852.7	12.6	Pt
	6823.3	[13.9	L	6855.6	[12.5	Pt
	6825.3	[13.9	L	6859.6	[11.2	Cy
	6826.7	[12.4	Pt	6862.7	[12.5	Pt
	6827.7	[13.0	Hi	6863.7	[12.6	Pt
	6830.6	12.5	Cy	6867.7	[12.6	Pt
	6831.6	[12.5	Cy	6869.7	[11.0	Pt
074922 U GEMINORUM—						
	6793.2	9.3	Ch	6822.6	13.9	Bw
	6795.3	9.2	Ch	6823.6	13.9	B
	6798.3	9.0	Th	6826.7	[12.4	Pt
	6802.5	9.7	Cy	6830.6	14.3	Mg
	6802.9	10.1	Sl	6831.6	[12.4	Cy
	6803.5	10.6	Cy	6833.6	[12.3	Pt
	6804.2	11.2	Ch	6835.6	14.0	B
	6804.3	11.5	L	6836.7	[12.3	Pt
	6804.6	11.3	Cy	6837.6	[13.3	Cn
	6805.3	11.9	L	6838.4	[13.3	L
	6805.9	12.9	Sl	6840.6	[13.0	B
	6806.3	12.9	L	6840.7	[13.3	Mg
	6806.6	13.2	B	6844.7	[10.5	Pt
	6807.3	13.8	L	6848.6	[12.3	Cy
	6807.6	13.5	B	6850.6	[12.3	Cy
	6810.3	13.9	L	6851.7	[12.3	Pt
	6816.7	[11.7	Pt	6852.7	[12.3	Pt
	6819.6	[13.3	Pt	6855.6	[12.3	Pt
	6820.6	13.7	Bg	6862.7	[11.2	Pt
	6821.6	[12.4	Cy	6863.7	[12.4	Pt
081473 Z CAMELOPARDALIS—						
	6802.4	12.6	Ry	6805.4	12.9	L
	6803.4	12.6	Ry	6806.3	12.3	L
	6804.3	12.2	L	6806.4	12.6	Ry
	6805.4	12.8	Ry	6806.7	12.4	Md
081473 Z CAMELOPARDALIS—						
	6807.3	12.4	L	6836.7	12.5	Me
	6810.3	12.4	L	6836.7	12.2	Pt
	6810.4	12.3	Ry	6838.4	12.3	L
	6811.4	11.3	Ry	6839.3	12.9	L
	6811.6	10.7	L	6841.6	13.0	L
	6811.7	11.2	Me	6842.4	13.0	L
	6811.8	11.0	Pt	6842.9	12.7	Pt
	6812.3	11.0	L	6843.7	12.3	Md
	6812.6	10.8	Pt	6844.6	13.0	L
	6812.7	10.8	Me	6846.4	12.7	L
	6815.6	11.3	Me	6847.4	12.9	L
	6815.8	11.3	Pt	6848.6	12.7	L
	6816.5	11.4	Ry	6849.7	11.2	Me
	6819.6	12.2	Pt	6850.6	10.3	L
	6819.6	12.1	Me	6850.7	10.6	Me
	6819.7	11.9	Md	6851.7	11.0	Me
	6820.6	12.1	Me	6851.7	10.8	Pt
	6821.5	12.7	Ry	6852.7	10.8	Pt
	6821.7	12.8	Pt	6852.7	10.9	Me
	6822.4	12.8	Ry	6855.6	11.1	Pt
	6823.3	12.7	L	6856.7	11.2	Me
	6824.4	13.0	Ry	6856.8	10.9	Pt
	6825.3	12.8	L	6857.8	10.9	Pt
	6825.5	13.1	Ry	6859.7	11.5	Me
	6827.6	12.8	Ry	6858.8	11.2	Pt
	6828.5	12.8	Ry	6861.8	11.8	Pt
	6830.4	12.6	Ry	6862.7	12.1	Pt
	6830.7	12.8	Pt	6863.7	12.2	Pt
	6833.4	12.4	Ry	6866.6	12.8	Bg
	6833.6	12.3	Me	6866.8	12.8	Pt
	6833.6	12.2	Pt	6867.6	13.1	Bg
	6834.5	12.3	Ry	6867.7	13.0	Pt
	6834.6	12.4	Me	6868.8	12.8	Pt
	6834.7	12.1	Pt	6869.7	13.0	Pt
	6835.1	12.1	Ch			
094512 X LEONIS—						
	6819.6	[13.3	Pt	6851.7	[12.6	Pt
	6823.6	[13.4	B	6852.7	[12.6	Pt
	6826.7	[12.6	Pt	6855.6	[12.6	Pt
	6830.7	[12.3	Pt	6863.7	[12.6	Pt
	6835.6	13.0	B	6864.6	[13.3	B
202946 SZ CYGNI—						
	6811.8	9.1	Pt	6851.7	9.0	Pt
	6812.9	8.9	Pt	6852.7	9.0	Pt
	6815.8	9.9	Pt	6855.6	9.2	Pt
	6826.7	9.1	Pt	6856.8	9.2	Pt
	6830.7	9.7	Pt	6857.8	9.3	Pt
	6833.9	9.3	Pt	6858.8	9.4	Pt
	6836.7	9.1	Pt	6861.8	9.6	Pt
	6840.9	9.2	Pt	6862.7	9.6	Pt
	6842.9	9.2	Pt	6863.7	9.7	Pt
	6843.8	9.5	Pt	6866.8	9.1	Pt
	6844.7	9.8	Pt	6867.7	9.2	Pt
	6845.8	9.4	Pt	6868.8	9.2	Pt
	6846.8	9.8	Pt	6869.7	9.1	Pt
	6847.7	9.8	Pt			

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1932.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.	Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
213843 SS CYGNI—							213843 SS CYGNI—						
	6737.9	8.6	Hr	6830.8	8.4	Ma		6850.6	11.8	L	6863.7	10.9	Hf
	6740.9	9.8	Hr	6831.8	8.5	Me		6850.7	11.9	Cy	6863.7	11.2	Pt
	6744.9	11.0	Hr	6832.7	8.1	Cy		6850.7	11.2	Ma	6863.7	11.1	Me
	6780.4	8.3	Ch	6832.9	8.1	Cy		6850.7	11.6	Me	6863.8	11.0	Ma
	6803.9	11.9	Cy	6833.9	8.9	Pt		6851.6	11.8	Jo	6865.7	10.4	Mg
	6804.9	11.9	Cy	6835.8	8.7	Sn		6851.7	12.0	Cy	6866.6	10.1	Ry
	6805.8	11.8	L	6835.9	8.9	Rn		6851.7	11.8	Pt	6866.7	10.4	Me
	6806.7	11.8	L	6836.7	8.5	We		6851.7	11.6	Me	6866.7	10.2	Fd
	6807.4	11.8	Ch	6836.7	8.8	Me		6851.9	11.6	Ma	6866.7	10.5	Ae
	6807.7	11.8	L	6836.7	8.9	Pt		6852.6	12.0	Jo	6866.7	10.6	Wd
	6808.6	12.0	Ah	6838.6	8.2	We		6852.7	11.7	Pt	6866.8	10.4	Pt
	6810.7	11.8	Jo	6838.6	9.7	L		6852.7	11.7	Me	6867.6	10.1	Wd
	6811.6	11.4	L	6839.6	9.9	Cn		6853.7	11.6	Cy	6867.6	10.2	Pc
	6811.8	11.6	Pt	6839.7	10.0	Me		6854.9	11.8	Ma	6867.6	10.7	Bg
	6811.8	12.0	Cy	6840.6	10.2	L		6855.4	11.8	Ah	6867.6	10.1	Ry
	6812.6	11.4	L	6840.8	10.4	Me		6856.7	11.6	Me	6867.7	10.2	Pt
	6812.8	11.7	Cy	6840.9	10.3	Pt		6856.8	11.7	Pt	6867.7	10.0	Me
	6812.9	11.6	Pt	6841.6	10.5	L		6857.8	11.6	Pt	6867.7	10.2	Sh
	6820.7	11.8	Jo	6841.7	10.6	Me		6858.6	12.0	Jo	6867.7	10.1	Ae
	6820.8	11.9	Ma	6841.9	10.7	Cy		6858.6	11.6	Cy	6868.6	10.0	Pc
	6822.7	12.0	Jo	6842.6	10.6	L		6858.7	11.8	Ae	6868.7	10.0	Me
	6823.6	11.8	L	6842.7	10.8	Cn		6858.7	11.5	Me	6868.8	10.2	Pt
	6823.8	11.9	Ws	6842.8	10.9	Me		6858.8	11.7	Pt	6869.6	9.9	Ry
	6824.7	11.6	Me	6842.8	11.1	Cy		6859.6	11.6	Cy	6869.7	9.6	Pt
	6825.6	9.9	L	6842.9	10.5	Pt		6859.7	11.5	Me	6869.7	9.5	Pc
	6825.7	10.1	Jo	6843.8	11.2	Pt		6861.7	12.0	Jo	6869.7	9.6	Fd
	6825.7	10.0	Me	6843.8	11.1	Cy		6861.8	11.1	Ma	6869.8	9.8	Me
	6827.5	8.4	Ah	6844.6	10.8	L		6861.8	11.6	Pt	6870.6	9.1	Ry
	6827.6	8.5	Jo	6845.8	11.5	Pt		6862.7	11.6	Pt	6870.7	9.0	Me
	6827.8	8.2	My	6846.8	11.7	Pt		6862.7	11.3	Me	6870.7	8.4	Mg
	6829.7	8.5	Me	6848.6	11.4	L		6862.8	11.1	Ma	6871.8	8.8	Me
	6829.7	8.3	GD	6849.7	11.5	Me		6863.7	11.8	Jo	6874.6	9.1	Ry
	6830.6	8.4	Cy	6850.6	11.7	Jo		6863.7	10.9	Wd	6878.6	10.9	Ry

SUMMARY OF OBSERVATIONS FOR MAY AND JUNE, 1932.

Observer	Initial	Vars.	Observations	Observer	Initial	Vars.	Observations
Ahnert	Ah	35	105	Hildom, A.	Hi	11	16
Aldwell	Ad	15	60	Hildom, L.	Hl	5	5
Allen, L. B.	Al	1	3	Houghton	Ht	78	409
Baldwin	Bl	73	251	Hurahata	Hr	4	22
Beloit College	BE	3	6	Jansen	Je	8	10
Bigelow	Bw	32	63	Jones	Jo	94	465
Bouton	B	80	130	Kohman	Ko	28	200
Brown, A. N.	Bn	2	5	Lacchini	L	157	431
Buckstaff, E.F.	Bf	5	6	Marsh	Ma	5	12
Buckstaff, R.N.	Bc	6	8	McKnelly	My	11	16
Bunting	Bg	11	12	McLeod	Mc	22	99
Chandler	Cn	8	11	Meek	Me	63	218
Chandra	Ch	134	240	Mennella	Mn	15	89
Cilley	Cy	36	200	Millard	Md	6	13
Ensor	En	69	189	Monnig	Mg	23	31
Ford	Fd	23	26	O'Byrne	Oy	6	12
Godfrey Club	GD	14	34	Peltier	Pt	215	579
Gregory	Gy	11	11	Popkavich	Pv	1	1
Hartmann	Hf	17	46	Proctor	Pc	27	32
Hess	He	4	12	de Roy	Ry	8	70

SUMMARY OF OBSERVATIONS FOR MAY AND JUNE, 1932.

Observer	Initial	Vars.	tions Observa-	Observer	Initial	Vars.	tions Observa-
Rochlin	Rn	6	6	Wares	Ws	6	6
Schulman	Sn	46	74	Watson	Wa	7	11
Shinkfield	Sl	33	72	Webb	Wd	22	144
Shultz	Sz	10	10	Weston Coll.	W	1	1
Simpson	Si	11	31	Wetherbee	We	18	39
Smith, F. W.	Sf	17	50	Williams, J.D.	Wi	30	31
Smith, L.	Sh	15	47				
Theile	Th	13	39	Totals		54	418	4706

The advantage of far southern stations for the observations of such stars as Mira Ceti, just south of the celestial equator, is well indicated by the fact that the star could be observed at a much later date than from the northern hemisphere, and with the result that the variable had almost reached its maximum brilliancy before becoming involved in the sun's rays.

Maximum 259 of SS Cygni was reached on May 2 and was of the rapidly rising broad type. Maximum 260 was reached on June 13 and was of the slow rising narrow type. SS Aurigae was at maximum, magnitude 10.9, on May 19. This occurred about 100 days later than the previously observed maximum and an inspection of the curve seems to indicate that the possibility of a maximum being unobserved is very small. R Scuti continues to prove of considerable interest and has been very thoroughly observed. No minimum fainter than magnitude 7.0 has been observed during the past two years at least. RY Sagittarii, SU Tauri, and R Coronae Borealis are at or near maximum, while S Apodis is quite faint and near minimum. RX Andromedae, Z Camelopardalis, and RR Tauri require close watching by all of our more experienced observers.

LEON CAMPBELL, Recorder.

June 29, 1932.

Comet Notes

By G. VAN BIESBROECK

Three comets have been discovered since the last notes were sent on May 23.

COMET 1932 *c* (KOPFF). The expected periodic comet Kopff was found May 25 by Bobone at Cordoba (Argentina) in the following position:

1932 May 25.0788 U.T. $\alpha = 15^h\ 11^m\ 18^s.8$ $\delta = -26°\ 11'\ 12''$ Magn. 12.

This is within 10′ of the position resulting from the careful computations by F. Kepinski of Warsaw (Poland). It indicates that the comet will come to perihelion on the date August 21.158 U.T., only four hours later than was predicted.

Shortly after the recovery of this little object it was seen by the writer as a round coma about 25″ in diameter with a slight central condensation. On June 28 it showed a well defined nucleus; the coma was, however, no longer concentric with this point but extended mostly in position angle 320°. The brightness had not changed much and since the minimum distance from the earth was reached in the beginning of June the object will remain faint throughout the present return.

COMET 1932*f* (NEWMAN). The next report of a cometary discovery came from the Flagstaff Observatory (Arizona). The discoverer, Newman, had recorded the object already on June 1 but the information was not given out until June 21, when the following three positions were announced:

1932 U.T.	α h m s	δ ° ′	M
July 1.269	16 18 ..	−6 12	13
7.304	16 4 30	−1 34	13
20.201	15 37 15	+7 56	13

Six hours after this information was received through the Central Bureau at the Harvard College Observatory, a first orbit, computed there by Whipple and Cunningham, was telegraphed. The three rough positions mentioned above which had been withheld at Flagstaff, were used in this preliminary computation but this sufficed to insure further continuation of the observations. The elements are:

Perihelion passage	1932 Sept. 27.0 U.T.
Node	244° 50′
Perihelion to node	73 50
Inclination	76 50
Perihelion distance	1.57 A.U.

They show that the comet will remain well observable for some time but that the date of maximum brightness is already gone by.

When first seen by the writer on June 22 the comet showed a sharp nucleus surrounded by a coma some 20″ in diameter extending in position angle 170° into a short tail visible over a length of 1′. On July 8 the tail had lengthened to about 2′ without appreciable change in the brightness of the object.

COMET 1932*g* (GEDDES). Two days after the announcement of Newman's comet, telegraphic information was received about one more new object discovered, this time in the southern hemisphere. The announcement came from the Melbourne Observatory and reported the following data under the name of Geddes:

1932 June 22.3194 U.T. $\alpha = 9^h\ 15^m\ 0^s$ $\delta = -84°\ 36'$ Magn. 10.

From observations made at the Cordoba and Laplata Observatories (Argentina), on the following days, Bobone at Cordoba computed the first elements:

Perihelion passage	1932 Oct. 26.95 U.T.
Node	222° 56′
Perihelion to node	356 32
Inclination	122 12
Perihelion distance	1.913 A.U.

The geometric conditions are such that this comet will stay in the southern hemisphere for a couple of months more, while gradually moving northward. The brightness is not expected to increase very much since the minimum distance from the Sun is quite large.

One more cometary object was announced July 1 but it has remained unconfirmed. According to the discoverer Schmitt (Algiers) the position was as follows:

1932 June 25.8662 U.T. $\alpha = 15^h\ 28^m\ 36^s$ $\delta = +11°\ 45'$ Magn. 13

and the daily motion $1^m\ 40^s$ west and 35′ north.

This position was within 20′ of Newman's Comet on that date and since the recorded motion corresponded exactly to that of the latter object some confusion

might have been expected if it had not been for the additional remark that the suspected comet was not Newman's. The two objects having the same brightness, they would both have recorded their images on photographic exposures. But no trace of the second object could be found on plates taken here before and after June 25 and no further information has become available from other observers so that the existence of the objeict is questionable.

As to the comets that were found earlier in the season, COMET CARRASCO is now too faint and too far west for further observations (last observation here July 5), COMET HOUGHTON-ENSOR although well placed for observation is no longer accessible, since its very diffuse coma was last seen here June 5, but COMET GRIGG-SKJELLERUP though quite faint is still being followed. Its brightness on July 9 was estimated as equal to that of a 16^M star.

The recovery of periodic comets Brooks and Borrelly may be expected before long. Both are morning objects whose positions become more favorable from day to day.

No trace of the presence of the former one was found so far on plates taken here July 11.

The search for Tempel's Comet 1866 I should now be started. The 1932 *Handbook of the British Astronomical Association* gives indications about the region of the sky where the comet is expected, but after an absence of 66 years the position is necessarily quite uncertain and considerable areas may have to be searched in the northwest evening sky.

Williams Bay, Wisconsin, July 11, 1932.

Notes from Amateurs

Notes Concerning Pittsburgh Amateurs

During the month of April, due to generally unfavorable weather, activity of the group was confined to indoor pursuits such as instrument making, study, testing, silvering of mirrors, and chart making.

A Committee of Arrangements was appointed at the May meeting to arrange a party to visit the recently completed 69-inch Perkins Observatory reflector at Ohio Wesleyan University at Delaware, Ohio. Transportation will be furnished all wishing to make the trip, several automobiles having been volunteered for the party.

Plans are being made to photograph the partial eclipse of the Sun, to be seen here as 88%, by those unable to make the New England trip. Solar cameras are being put into shape for the event, and one of the members is experimenting with silvered lenses as a method of eliminating screens and extremely fast shutters.

Meetings during the months of July and August will be held outdoors and will be in the nature of observing parties.

Mr. Samuel Arnold, III, made a very complete report at the May Meeting on the method of determining the stellar magnitude of the sun, and explained the different magnitude scales in common use. The numbers of stars known of certain absolute magnitudes was given to point out the fact that our Sun is an average star in several ways. The faintest and the brightest stars were mentioned by number, and the absolute magnitude of the sun at the distance of 10 parsecs given.

Mr. John Seiple gave a fine explanation of the method of ascertaining the size of planetary and lunar discs at the prime focus of various instruments, citing as examples the fact that a 6-inch amateur reflector of 48-inch focal length would give a lunar disc of 0.4-inch, while the size of the disc in the 100-inch Mt. Wilson reflector at F10 would be 13.4 inches. Mr. Roe pointed out the fact that the lunar disc at the focal plane of the Allegheny refractor was 4.98 inches.

Further calculations of Souther and Seiple showed that the diameter of Mars in the 40-inch Yerkes refractor, focal length 65 feet, would be about 0.1 inch, the image of Saturn being about 0.07 inch.

Mr. Arnold at the next meeting will explain a newly invented photometric method of checking the speed and apertures of camera shutters, as devised by a friend of the group.

Mr. Souther is constructing a pendulum clock, with invar rod carrying self-compensating weight, run with dry batteries, and having an anticipated accuracy of .03 sec. per day. With it a chronograph will be constructed and Moon occultation work be instituted.

LEO J. SCANLON, *Secretary.*

Valley View Observatory, Pittsburgh, Pennsylvania.

Amateur Telescope Makers of Chicago

The business session of A.T.M.O.C. voted to make up a scrap book to contain a large number of letters, several sky maps, leaflets on "The Moon" and "Meteorites," published by Field Museum; "Making the Glass Disk for a 70-inch Telescope Reflector," a research paper from the Bureau of Standards; "The Yerkes Observatory"; photographs of amateur telescopes, tools, parts; catalogues, and much information desired by many amateurs. Already we have over 100 items. Sections for other societies will be provided. Amateurs, especially those in other localities, are invited to contribute—in effect we shall have a giant chain letter with A.T.M.O.C. acting as the clearing house. Amateurs, mobilize your material and focus on A.T.M.O.C. It is not expected that the average amateur will respond. The venture is for the few serious minded who wish to make a scientific survey of a wider field and rub ideas with others like minded.

Out of town amateurs may rent the scrap book which will have a stout cover and be packed for mailing in a canvas container.

May Meeting: McCord brought out the advantages of long focus mirrors as follows: ease of parabolizing, large images, small prism required, less critical focus, can use eyepieces of lower correction. A very interesting demonstration of difference in size of image was given in the shape of three 3-inch mirror blanks polished but not figured, f1, f4, and f72.

W. S. Buttles' Round Table discussed the newly proposed A.T.M.O.C. standard 36-inch portable telescope, advantageous particularly where city lights interfere—illustrated with his 8-inch, f4.5. The mirror has good light grasp, and while a longer focal length might work the mirror at greater efficiency, the bright images and much greater efficiency of the short portable mounting make for greater overall efficiency. As much less work is required for a steadier, smoother working mounting using a 36-inch focus than for say one of 6-foot focus, the time and money saved on the mounting can then be put on a larger mirror of short focus. The net result for time and expense should favor the portable telescope. Especially is this true since A.T.M.O.C. has standard mirror blanks fine ground to 36-inch focus available.

June Meeting: Members and visitors of A.T.M.O.C. may expect an afternoon and, perhaps, an evening crammed with a variety of interesting activities if they attend the next meeting beginning at 2:00 P.M., Sunday, June 5, at the Adler Planetarium.

Charles W. Eliason, Jr., expects to bring out many worthwhile and interesting points on portable telescopes using as a demonstration his 6-inch and its mounting.

In accordance with its new plan the meeting will adjourn at 4:00 o'clock so that those who wish to may attend the Planetarium lecture, the subject of which is, "The Heavens at the North Pole."

If the evening is clear, after a lunch in the Loop we shall be invited to Eliason's roof "sky" observatory to use his 9½-inch telescope. We shall attempt to split close doubles (maybe under 1" of arc separation).

The July meeting will be held the second Sunday of the month, July 10, as the first Sunday is on the third and many amateurs will be away over the holiday. Arthur Pursell is to give an account of his visit to the Perkins Observatory. The other speaker has not yet been selected.

Correspondence from out of town amateurs is welcome. Anyone wishing a sample copy of our bulletin, "The Astroscope," may obtain a copy of the next issue by sending a stamped self-addressed envelope to Wm. Callum, 1319 West 78th Street, Secretary.

L. I. BUTTLES, *Publicity*.

10728 South Artesian Avenue, Chicago, Illinois.

Light and the Universe

It is a generally accepted belief that light has weight and if there is weight there must be matter. The space which exists between us and the many extra-galactic nebulae must contain some form of matter which offers resistance. This matter, of course, must be extremely tenuous, and therefore offers very little resistance to the light which transits the immense space between the supposedly equidistant nebulae. But light meets appreciable resistance by the time it has reached us or any other nebula. This slowing up of the light is, I think, the cause of the noticeable Doppler effect which has made us believe that the universe is expanding. When thought of in this way, the more distant the nebula is the greater is its apparent speed of recession. The spectrographic reports of various observatories, especially those of Mt. Wilson, all seem very convincing, but the spectrograph does not record motion at right angle to the line of sight.

This inter-stellar, inter-galactic, highly tenuous matter may be called cosmic dust for want of a better name. Now, when the light from the nebula in Andromeda finally reaches us it has passed through cosmic dust about equal to the density of a horse blanket. This would mean an average density of about one molecule per cubic foot of space. Of course, this intervening matter tends to flood a galactic system and gradually rarefy as the distance from it increases—as does an atmosphere. I believe that if allowance were made for displacement in the spectrum owing to resistant matter in space, we would not have an expanding universe at all but quite a gentle system, perhaps revolving about a common center. It seems quite unreasonable to have the entire known universe rushing away from *us*; surely our feeble galaxy is not that repulsive.

It seems quite reasonable to believe that if suns, planets, clusters, and nebulae all rotate the whole universe should revolve about a common center instead of

expanding and contracting. This common center will contain more spiral nebulae in it than outlying regions by reason of the action of gravity. And too, perhaps, there may be many universes spread through space just as galaxies are spread through the universe; but we either lack instruments with which to detect their peculiar radiation or our telescopes do not have a large enough light grasp to probe space to their depth. There is no doubt that other types of radiation are existent on the earth and in space which have not yet been discovered. Perhaps there are rays of higher penetrating power and voltage, and of shorter wavelength than even the well known cosmic rays. I believe that all forms of radiation from long radio waves through light waves, X-rays, and cosmic rays are all different wave-lengths of the same type of electrical radiation.

I hope some day that the universe will be considered as a revolving system and that all radiations from it will be thought of as emanating from an electrical source. However, the whole point of this article is to stimulate a thought in somebody, somewhere and perhaps bring forth something worth while.

WILLIAM S. VON ARX.

573 Monroe St., Brooklyn, New York.

Zodiacal Light Notes

By W. E. GLANVILLE

ZODIACAL LIGHT SPECTRUM.

1. Lowell Observatory: In the *Observatory Circular*, February 20, 1931, Dr. V. M. Slipher reports his conclusion that the Zodiacal Light is composite. "In the main it appears to be made up of a strong background spectrum of sunlight (which is doubtless strengthened by scattered starlight) upon which are superposed a number of emission lines and bands." The emission lines listed are those near 3916 A, 4080 A, 4175 A, 4280 A, 4424 A, and the strong auroral line 5577 A. "The emissions 3916 A and 4280 A are doubtless the strong negative nitrogen bands, well known features in spectra of auroral displays and not present in the spectrum of the night sky—except when an auroral display is present. . . While these results indicate that the most of its light is sunlight, the presence in its spectrum of the auroral nitrogen flash emissions and its apparent accentuation of the night sky radiations in it would suggest that the Zodiacal Light in part arises in the earth's atmosphere; hence this new spectral information makes more interesting the rather unsettled Zodiacal Light problem."

2. Lick Observatory: For the past year Dr. J. H. Moore has given attention to the Zodiacal Light spectrum. In a recent communication Dr. Moore says that "the spectrum of the Zodiacal Light consists of a strong background absorption spectrum apparently agreeing closely with that of the Sun, upon which are superposed a number of emission lines and bands. The strongest of these emission lines is the auroral line 5577 A. The auroral lines 3916 A and 4280 A are also present . . . So far as my observations go I am able to say that the Zodiacal Light spectrum appears to indicate that the major portion of the light is reflected sunlight. The question still unsolved is, does any of the light of the emission lines come from the Zodiacal Light itself, or are they merely the emissions from the night sky, presumably from the upper atmosphere?"

3. Poona, India: In *Nature*, February 20, 1932, is a note by Mr. K. R.

Ramanathan who has photographed the spectrum. He found the spectrograph sufficiently powerful to bring out the night sky line 5577 A, "which comes out strongly, *decreasing with the decrease of intensity of the Zodiacal Light.*" He raises the question whether the luminosity of the night sky and of the Zodiacal Light may not be identical in origin. Drs. Moore and Slipher will continue their investigations and will try to obtain definite information of the Gegenschein spectrum. The problem is to separate the Zodiacal Light spectrum proper from the general spectrum of the brightness of the night sky. So far, their work confirms the investigation made by Dr. E. A. Fath at Mt. Hamilton and Mt. Wilson, 1907-1909, which demonstrated that for the most part the Zodiacal Light is reflected sunlight.

Evening Zodiacal Light. Mr. Stuart L. O'Byrne, Webster Groves, Missouri, reports an observation made on January 24, 7:00 P.M. Most of the Light was in Aquarius and Pisces; the brightest part lay between λ Aquarii and λ Piscium and was considerably brighter than the Milky Way in Cassiopeia and Cepheus. The somewhat indistinct apex was indicated about 2° northeast of ξ Piscium. The boundaries were not well defined but the diagram shows the greater part of the Light north of the ecliptic. The writer made observations on April 22, 28, and May 2. On April 22, 8:30 P.M., the northern boundary passed about half the apparent distance between the Pleiades and Perseus; thence the Light broadened to the horizon. The south boundary passed about half way between Orion and the Hyades. The glare of Venus made a determination of the apex impossible. On April 28, 9:00 P.M., the apex was detected a few degrees west of Praesepe. The horizon spread was about 30°. On May 2, 8:30 to 9:00 P.M., the north boundary passed near η and ζ Aurigae and just clear of Perseus. The Hyades were within and close to the south boundary. As the season advances the trend of the Light is more and more northward preparatory to the summer north horizon luminosity.

Morning Zodiacal Light. On April 15, 3:30 to 4:00 A.M., the writer observed the morning Light. Lying low along the east and southeast horizon the Light could not be traced beyond Saturn in Capricornus. α and β Capricorni were dimmed and α, γ, ζ, and η Aquarii were covered. The contrast of the dark sky between the galaxy in Cygnus and Aquila and the Light was marked. As dawn came the Light in Capricornus faded and the Light in Aquarius brightened. Then followed general daybreak.

South Africa. It is a pleasure to announce that through the courtesy of Dr. J. S. Paraskevopoulos, Boyden Station, H.C.O., and Mr. H. W. Schonegevel, honorary secretary of the Astronomical Society of South Africa, a group of observers has been organized in Cape Colony and Natal from whom reports are expected in a few months.

Ukraine Reports.—M. V. Tshernov, Krementsbourg, Ukraine, has sent the following reports. On August 20, 1931, he observed the morning Zodiacal Light at 12:45 A.M. It was visible in Gemini, feeble with diffuse boundaries, the northern boundary more diffuse than the southern. Its elongation was 49° west of the sun. At 8:55 P.M., November 28, 1931, he saw the evening Light with its vertex between δ Capricorni and β Aquarii, about 79° east of the sun. The Light was faint and the boundaries were very diffuse. On January 31, 1932, one hour and forty minutes after sunset he found the Light feeble and white, the vertex near the Pleiades, 108° east of the sun. On March 2, 1932, about one and three-quarters hours after sunset the Light was white, boundaries were diffuse, elongation 78°

east of the sun. MM. L and A. Andrenko at Kharkow, Ukraine, observed the evening Light on February 24 and March 1 when, enhanced by Venus, the body of the Light was quite bright and appeared somewhat greenish in color. At M. Tshernov's station, latitude 49° 4', longitude 27° East, the Zodiacal Light is visible in the west from November to April, in the east from late August to December. During November and December it is visible morning and evening.

Recently the writer has given attention to the Zodiacal band which is observable in May and early in June. On May 26, 28, 29, June 3, 6, 7, at about 9:30 P.M., he found the band extending east from Regulus through Virgo and Libra to the head of Scorpio. While quite faint it was unmistakable. Strange to say, on June 8 while observing the morning Zodiacal Light between 2:00 and 3:00 A.M., he failed to note any trace of the band from Libra to Scorpio then low in the southwest. Yet he had seen it clearly about 9:30 P.M. of the same night. What caused the disappearance in five hours? Possibly atmospheric absorption near the horizon. The presence or absence of the Milky Way in the observer's sky has been suggested as an explanation of the fact that Zodiacal bands are seen near the solstices and not seen near the equinoxes. Inasmuch, however, as observers in the tropics report the Zodiacal Light as arching the sky from horizon to horizon the year round, it may be a better interpretation to say that in temperate latitudes the presence of Zodiacal bands depends on the configuration of the polar inclination of the earth with respect to the sun at or near the solstices. In his admirable paper on the Zodiacal Light (*Proceedings of the American Academy*, 1883) Professor A. Searle has an extended reference to Zodiacal bands as related to the semiannual variation in the elongation of the vertex. It was Professor Barnard's opinion that the periodic elongation of the Gegenschein is due to its "being seen on a Zodiacal band."

On June 8, from 2:00 to 3:00 A.M., the morning Zodiacal Light was seen. At first no indication of it could be discerned but at 2:30 a slight brightening of the sky was seen extending through Pisces to eastern Aquarius. At 2:50 the Light became stronger and spread over Perseus and Aries thence curving round just below the Square of Pegasus. By 3:00 A.M. dawn broke over the sky.

The Rectory, New Market, Maryland.

General Notes

Dr. E. A. Fath, of the Goodsell Observatory, and Mr. W. H. Bovey, of St. Paul, are planning to observe the total eclipse of the sun on August 31 at Fryeburg, Maine, in connection with the party from the Lick Observatory.

Dr. C. H. Gingrich will join the Franklin Institute eclipse party at Conway, New Hampshire, on August 28 and take part in the eclipse program on August 31. Dr. Gingrich will assist in the lecture program at the Adler Planetarium on his way to the eclipse during the first week in August.

Dr. John A. Miller has informed us recently that it has now been decided that the Swarthmore Eclipse Party will be stationed at Derby in northern Vermont. In going so far north Dr. Miller is acquiescing in a suggestion from the Eclipse Committee of the A.A.S. that the several parties be distributed so as to cover the entire path as far as possible.

Dr. J. S. Plaskett, director of the Dominion Astrophysical Observatory, was one of three who received honorary degrees at the annual convocation of McGill University on May 26. The other two were Surgeon-General Robert Hugh Patterson, U. S. Army, and Dr. Alfred North Whitehead, professor of philosophy at Harvard University.

Dr. Edwin B. Frost to Terminate Duties as Director

In accordance with the statutes of the University of Chicago, Edwin B. Frost, professor of Astrophysics since 1898 and Director of the Yerkes Observatory since 1905, will retire on July 1, 1932, at the completion of his 65th year. His residence will continue at Williams Bay, Wisconsin. He will also give up the managing editorship of the *Astrophysical Journal,* which has been in his hands for most of the last thirty years.

Dr. Otto Struve, who has been a member of the staff of the Observatory, for the past ten years, succeeds to these duties. He will be well known to astronomers and astrophysicists through his many contributions to astrophysics in recent years. He is the son of Ludwig Struve, director of the Observatory at Kharkov; grandson of Otto Struve of Pulkova, and great grandson of Wilhelm Struve, founder of the Pulkova Observatory.

Yerkes Observatory Directors Entertained.—On June 30 the staff of the Yerkes Observatory gathered at the home of Professor and Mrs. George Van Biesbroeck, who entertained in honor of both Director E. B. Frost who became emeritus on that day and of the incoming director, Otto Struve, who took charge the next day.

The Washburn Observatory of the University of Wisconsin will send a small expedition to Maine or New Hampshire to observe the total eclipse of the sun on August 31. Messrs. Kunz and Stebbins will repeat their measures of the total light of the corona, using the same photo-electric cells as in 1918 and 1925. It is hoped that further evidence on the variation of the brightness of the corona through the sun-spot cycle will be secured.

Astronomical Tours

The Royal Astronomical Society of England has issued a twenty-page booklet, beautifully illustrated with views from the United States and Canada, descriptive of tours which are proposed in connection with the total eclipse and the meetings of the International Astronomical Union. We quote from it as follows:

"The invitation from America to hold the next meeting of the International Astronomical Union in the United States gives astronomers an opportunity of combining attendance at the 'Parliament of Astronomy' with observation of the total solar eclipse on August 31. To this unique opportunity is now added the further attraction of a tour across Canada and the United States, visiting the principal observatories (by kind invitation of the Directors), and incidentally combining with these astronomical pleasures visits to some of the most beautiful and awe-inspiring scenery in the world. The McGill University at Montreal, the University of Toronto, the Dominion Observatory at Ottawa, and the Dominion Astrophysical Observatory at Victoria will enable members to see for themselves what our great Dominion is doing for astronomy.

"Leaving the Dominion of Canada, members will proceed by the east coast route to San Francisco, where the University of California is prepared to show

them, with traditional hospitality, the many delights of this neighborhood, including visits to the famous Lick Observatory on Mount Hamilton, and the Students' Observatory at Berkeley. The Director of the Lick Observatory has generously invited a selected number of the party (up to the limit of accommodation at the Observatory) to spend a night on the mountain, and an opportunity will be afforded to all members of the tour to "have a peep for themselves" through the telescopes. Next we come to the Mecca of astronomers, Mount Wilson Observatory, with the world-famous 100-inch reflector. Two nights will be spent in the bungalow camp on the top of Mount Wilson, and it is safe to predict that this will be an unforgettable experience. A visit will also be paid to the Laboratories of the California Institute of Technology at Pasadena. The Grand Canyon of Arizona, and that extraordinary object, Meteor Crater (formed thousands of years ago by the impact of a gigantic meteor falling on the earth) and the Lowell Observatory will be visited *en route* to Chicago, where members will have an opportunity to visit the Adler Planetarium and Astronomical Museum; an excursion to Yerkes Observatory will also be made from Chicago. No trip to Canada would be complete without a visit to Niagara Falls. Members of Tour A will join Tour B in New York and proceed to Douglas Hill, near Mattocks Station, Maine, for the climax of the tour—the total eclipse of the sun. No need to paint for astronomers the attractions of this mighty spectacle—should fortune and the weather prove kind!

"Three tours are proposed as follows:

"Tour A.—Leaving England July 20, visiting Quebec, Montreal, Ottawa, Winnipeg, Banff, Lake Louise, Victoria, San Francisco, San José, Pasadena, Mount Wilson, Grand Canyon, Flagstaff, Meteor Crater, Chicago, Williams Bay, Toronto, Niagara Falls, New York, Boston, thence Mattocks for the eclipse, afterwards to Montreal, to sail September 1 for England. Option of travel from Mattocks to Boston for I.A.U. Meeting and sail from Montreal September 10.

"Tour B.—Leave England August 12, visiting Quebec, Montreal, Ottawa, Toronto, Niagara Falls, Philadelphia, New York, Boston, Mattocks, and sail from Montreal September 1. Alternate provides for return to Boston for I.A.U. Meeting, sailing for England September 10.

"Tour C.—Leave England August 19, with the principal object of witnessing the Eclipse at Magog and visiting also Quebec and Montreal. Sail September 1 for England."

Amateur Astronomers Meeting.—At the invitation of Professor C. H. Smiley of Brown University, a small group of amateur astronomers met Thursday evening, May 5, 1932, at Ladd Observatory for the purpose of organizing a society devoted to the interests of amateur astronomy. Rev. J. G. Crawford of Saunderstown, Rhode Island, was elected president; Mrs. Elizabeth Morpeth of Central Falls, Rhode Island, was chosen vice-president, and Miss Maribelle Cormack of the Roger Williams Park Museum, Providence, Rhode Island, secretary-treasurer. The name adopted for the organization was "The Skyscrapers."

Persons with a genuine interest in astronomy who care to join the society should write to Miss Cormack at the Roger Williams Park Museum stating in what particular branch of astronomy their interest lies and whether they are over twenty years of age and thus eligible for full membership.

American Astronomical Society and International Astronomical Union Meetings

For the sake of convenience, which is at once quite obvious, abbreviations which have come into vogue will be used here for the long words of the title. They are the A.A.S. and the I.A.U., respectively.

As usual the A.A.S. will hold a summer meeting this year. It will, however, be limited to three events, all on September 2, at Cambridge, Massachusetts. There will be a meeting of the Council at 10:00 A.M., the annual business meeting at 2:00 P.M., and a formal reception to the I.A.U. at 8:30 P.M.

The reason for this shortened program is to give the I.A.U. the right of way. Invitations have been sent out by the U. S. National Committee in the name of Sir Frank Dyson, president of the I.A.U., to the meetings which are scheduled for September 2-9, 1932, also at Cambridge, Massachusetts.

The session will be begun on Friday afternoon when registration and a meeting of the executive council will be held. The evening will be devoted to a reception by the A.A.S., as stated above. On Saturday morning, at a general assembly of the members and invited guests, an official welcome will be tendered to the Union. In the afternoon there will be a garden party at the Observatory residence. Sunday will be given over to an excursion to the Oak Ridge Station of the Harvard Observatory. All of Monday and Tuesday morning will be used for separate sessions of the several commissions. On Tuesday afternoon an excursion by boat to Plymouth will be made, with dinner at Plymouth. Wednesday will again be given over to sessions of the Commissions. In the evening a visit to the Massachusetts Institute of Technology will be made, at which time Sir Arthur S. Eddington of Cambridge University will deliver a lecture on the topic "The Expanding Universe." The public is invited to be present at this lecture. On Thursday morning will be held the second general assembly; in the afternoon an excursion to Wellesley College will be made; in the evening the dinner by invitation of the American Section will be given. The third general assembly, the concluding event of the session will be held on Friday morning.

Early in June there were sixty-seven astronomers from foreign countries who had notified the local committee of their intention of attending the meetings. This promises to be an occasion of much interest. Those who attended the previous meeting in Holland in 1928 know its possibilities. It was there Professor Schlesinger so aptly remarked that, although America might not be able to offer the same kind of entertainment as was offered in Holland, nevertheless America would furnish a total eclipse of the sun in 1932. It will be many years before such a trilogy as a total solar eclipse, a meeting of the A.A.S., and of the I.A.U. concur again.

International Congress of Mathematicians.—This congress is scheduled to be in session in Zurich, Switzerland, from September 4 to September 12 of this year. As is customary the week will be taken up with scientific sessions and with social events. The scienific sessions are divided into two parts, general lectures and meetings of Sections, of which there are ten. The scope of the congress is indicated by the statement in the invitation that the general lectures should give a fairly complete picture of the present situation in Mathematics. This congress is held once in four years. The preceding congress convened in Bologna, Italy, in September, 1928.

The Effect of Eclipses Upon Animals

Those who have had opportunity of observing birds during a total eclipse of the sun have noticed that the birds give every indication of fear as a consequence of the eclipse. These birds may be compared to untutored persons who consider an eclipse as somewhat entirely out of the ordinary and as an indication of the wrath of God. Possibly, therefore, the beginning of astrology may be traced to the birds. Unfortunately, information is not to be had which makes such a conclusion absolutely sure. The total eclipse of the sun which will be visible in America in August affords the desired opportunity of increasing our knowledge at this point. It would be of great value to have observations as follows:

1. The behavior of domestic animals such as dogs, cats, and horses. 2. The behavior of birds and wild animals. 3. Do these animals exhibit excitement or fear during the partial or only during the total phase? 4. How does this excitement or anxiety express itself? 5. Does this condition continue or do the animals become quieted immediately after the totality? 6. Do these animals seek protection from persons or do they hide away in the trees and houses? 7. Are certain animals unaffected while others become excited under the conditions of the eclipse?

Anyone making observations such as are here indicated would confer a favor by communicating them to this magazine, or directly to Dr. E. Zinner, Remeis Observatory, Bamberg, Germany.

The Brightness of Jupiter

I have made two measurements of the brightness of this planet, about the period of opposition. I have compared the planet, as it was visible in field glasses turned with the objective towards the eyes, with the stars visible to the naked eye. The brightness of the planet was found to be $-2^{M}.4$ on March 6 and $-2^{M}.3$ on March 9.

I also observed Jupiter twice in broad daylight. On December 27, 1931, 29 minutes after sunrise, the planet was visible with the help of the glasses, but invisible to the naked eye. On April 15, 1932, 34 minutes before sunset, the planet was easily visible in the glasses like a little asterisk on a blue background, a very interesting spectacle. Venus was also easily visible at the time in the western part of the heavens.

V. Tshernov.

Oktjabrskaja, 77, Kremencug, 2, Ukraine, U.S.S.R.

The Aurora of May 29, 1932

Starting at 9:30 P.M. and lasting until 12:00 P.M. on May 29, there was a brilliant display of the Aurora Borealis. At 9:30 I first noticed the auroral arc which extended from east 35° to west 40°, reaching an approximate height of 19° above the northern horizon.

At 10:30 several coronas developed which were very brilliant. The rays or streamers started as a thin double line in Cepheus, converging with the apex at 24 Cephei, broadening still more as they passed the northern point until they finally merged into a bright patch slightly lower than θ and o Ursae Majoris. The patch was approximately 12° in diameter.

There were minor displays approximately every 6 to 8 minutes and brilliant ones approximately every 19 or 20 minutes.

During the display Mr. Hickerson, who was observing with me and giving the time while I plotted, and I witnessed and plotted the paths of 6 meteors, 3

which were seen during the maximum brilliancy between 10:30 and 11:00 P.M. were blood red in color. After 11:00 P.M., 3 more were seen and recorded, these being white in color.

Knowing that the Aurora Borealis is said to be connected with electrical disturbances, their origin being on the sun, the next morning I turned my telescope on the sun, and found several rather prominent sun-spots in the southwest quadrant. From answers received through the medium of newspaper publicity on the display I obtained some interesting information. A Mr. Lewis, of this city (Webster Groves, Missouri), wrote his brother, who resides near the mouth of the Columbia River in Oregon, asking if he had seen the phenomenon. His reply was: "I don't know whether I saw what you referred to or not but on that date shortly after 7:00 P.M., P.S.T., my radio went wild. I could receive nothing but static, which after a while ceased also." According to a report received from the Weather Bureau Station at the Airport, there was a strong outbreak shortly after 9:00 P.M., C.S.T., corroborating his story.

This clearly shows the connection between the aurora and electrical disturbances as was also illustrated by the aurora seen on March 7, 1918, when telegraph connections were put out of commission for several hours. These displays are comparatively rare south of latitute north 45° and become more numerous as one nears the auroral pole at west 70° north 81°.

JOHN WESLEY SIMPSON.

Webster Groves, Missouri.

The Aurora of May 30, 1932

A most unusual display of Northern Lights was observed in Cleveland during the late evening of May 29 and the early morning of May 30. This display was apparently visible all over the United States and as far south as New Mexico. Two wide bands (about 10 degrees) of pale, white light appeared in the sky and

PHOTOGRAPH OF AURORA AT CLEVELAND, OHIO, MAY 30, 1932.

remained visible during the night, the outer band reaching as high as Polaris and extending from the east to the west point. Many vertical streamers moving rapidly and changing in form converged to a point some 5 degrees south of the zenith. At times waves of light moved very rapidly from the horizon to the zenith. Their motion resembled the shadow bands although they were not so uniform. Some of the vertical streamers showed a greenish pale light.

The accompanying photograph was made at the Warner and Swasey Observatory at 1:30 A.M. on May 30 with an exposure of 5 minutes. The center of the photograph shows the trails of stars in the constellation of Perseus.

It is interesting to note that during the week of May 22 we have had unusual sun-spot activities.

J. J. NASSAU.

Planetarium Proposed for Buenos Aires.—The following Commission has been appointed by the City of Buenos Aires for the purpose of making a study of the financing, construction, and operation of a proposed Planetarium and Aquarium, in a single building, to be erected here: Dr. Adolfo D. Holmberg; Sr. Carlos Della Paolera, City Engineer; Sr. Felix Aguilar, astronomer; Sr. Carlos E. Becker, architect; Dr. Frank L. Soler. The possibility is suggested of utilizing a single site for the construction of an Aquarium and institute of hydrology along with the Planetarium which would be used not only as a stimulus to popular culture but also for the studies of the sky which school and university students are required to make.

The Sequence of Extra-Gallactic Nebulae

According to Jeans the sequence of extra-galactic nebulae begins with the globular, fuzzy masses with little or no rotation and ends with the flat cartwheel type that rotates rapidly. There is another way of looking at this. In the first place let us compare the spirals with arms widely open and those with the arms closely coiled and unresolved. It has already been suggested that the open type is the younger since it seems more likely that the closely packed coils develop with the continued rotation of an open spiral rather than the reverse, that the open form is the result of an unwinding process. The sequence shows that by imperceptible degrees the closely coiled spirals merge into elliptical spiral nebulae with no sign of resolution, and judging from this we may assume the age sequence of these three types to be open spirals the youngest, then closed spirals, and finally elliptical spirals.

There are other criteria by which we may extend the sequence. Seven-eighths of the nebulae are receding from the galactic system, suggesting that recession is the normal or usual condition while an approach towards the galactic system may be exceptional and consequently a temporary condition. If this be true, then the nearest nebulae are the youngest as a rule. According to Hubble the Clouds of Magellan are the nearest of all extra-galactic nebulae and Andromeda nebula is one of the nearest spirals. There is also the matter of velocity: elliptical spirals move with the greatest velocity, then come the open and closed spirals with less and finally the Clouds of Magellan with least, suggesting that the latter may be the youngest, then the spirals and finally the elliptical nebulae. As Shapley points out, the Clouds of Magellan may be detached portions of the galactic system. If so, we may assume that these Clouds, which already show traces of spiral arrangement, will eventually develop into open spirals, losing their present condition of turbidity. As they develop they may grow larger and acquire greater

velocity until they reach the Andromeda nebula stage.—The putative stages of development up to this point are exactly analogous to that of a vortex in connection with the Bérnard-Kármán street vortices.—Subsequently we may expect them to continue to increase in velocity but, having passed the condition of greatest stability, they may at the same time begin to grow smaller until they arrive at the elliptical nebula stage, where the average diameters are about one-tenth of that of the other spirals. From then on it is a case of degeneration to the globular, fuzzy stage mentioned by Jeans, and from thence to the point where the nebula completely disappears, having been deadened or damped out of existence. There is yet another type of spiral nebula known as the barred spiral. Data are as yet insufficient to determine their probable nature, but it may be that they represent a condition of resonance frequency (or frequency of maximum velocity), arising in connection with heavy damping of the nebulae and incidental to a degenerative loss of harmonics.

To recapitulate, the age sequence of extra-galactic nebulae would then be as follows: (1) part of the galactic system; (2) Clouds of Magellan; (3) open spirals; (4) closed spirals; (5) elliptical spirals; (6) barred spirals (?); (7) fuzzy, globular, chaotic masses of gas; (8) total extinction. According to the present viewpoint we might infer that the galactic system dominates the entire field of the universe, setting up in the outer confines of its field disturbances so violent as to result in the annihilation of other competing systems. So far as mathematics is concerned all processes are reversible and it is just as legitimate to regard the extra-galactic nebulae as evidence of the annihilation of systems as to consider them evidence of new creations. Our most important empirical bases of judgment apparently are the relative age of open and closed spirals and the fact that there is seemingly a sequence. Frankly, I am inclined to regard the viewpoint that extra-galactic nebulae represent new creations as what might be called a Laplacian fixation without sufficient foundation in fact.

J. B. Penniston.

Seattle, Washington, May 16, 1932.

Research Astronomer Lost by Drowning

Just before the final forms of this issue were put on the press, an account of a most regrettable accident which occurred on June 26 was received.

The overturning of a canoe resulted in the drowning of Miss Adelaide Ames who has recently become well known in astronomical circles because of her sigificant researches in connection with theories developed by Dr. Harlow Shapley, Director of the Harvard College Observatory.

The following is taken from the report of the accident in the *Boston Transcript* of June 27, amended in some details by Dr. Shapley:

Miss Adelaide Ames, noted woman astronomer and research assistant at the Harvard College Observatory, lost her life in Squam Lake, near Holderness, N. H., yesterday, June 26, when her canoe capsized. News of the tragedy was received today by her associates at the Harvard Observatory.

Miss Ames, who was thirty-two years old and the daughter of Colonel T. L. Ames of the United States Army, lived at 3 Concord avenue, Cambridge. She was passing a vacation at Squam Lake and was canoeing with a companion when the accident occurred. She attempted to swim to shore after the canoe upset, but her strength failed and she sank before help could reach her. Her father went to the lake today to direct the search for her body, which has not been recovered.

Both Miss Ames and the young woman who was with her on the fatal canoe

trip were known as good swimmers, according to their friends at the Squam Lake camp, and were not alarmed when the canoe overturned. As they started to swim ashore, the astronomer's companion was in the lead, and when she chanced to look behind her she discovered that Miss Ames had disappeared. Although a search was quickly organized, no trace of her could be found. An airplane circled today over the spot where the canoe overturned, but the pilot failed to discover the body of the young woman.

A graduate of Vassar College, Miss Ames received her master's degree from Radcliffe and had been research assistant at the Harvard Observatory since 1923. She gained fame in the field of astronomy by her surveys of external universes, in which she collaborated with Dr. Harlow Shapley, director of the observatory.

"Her chief scientific work," said a statement from the Harvard Observatory today, "in collaboration with Dr. Shapley, was a detailed survey of the brighter extra-galactic nebulae. Miss Ames published in 1931 a catalog of nearly 2800 external galaxies forming a system in the constellations of Coma and Virgo near the North Pole of the Milky Way. This survey is an extensive analysis of the number, magnitudes, sizes and classifications of these outside universes.

"Miss Ames also published with Dr. Shapley, a series of notes on the Coma-Virgo Cloud of Galaxies. At present there is in press a study of all the galaxies brighter than the thirteenth magnitude over the entire sky. Probably no other survey of these objects has been so complete and so uniform as this work by Miss Ames and Dr. Shapley. It gives an extensive catalog based on precise and uniform observations embracing every object of this kind down to the magnitude limit chosen."

Miss Ames was a member of the American Astronomical Society and was a delegate to the International Atronomical Union in Leyden in 1928. She was a member of the international commission on nebulae and secretary of the local committee formed to organize the meeting of the International Astronomical Union which will take place at Harvard next September.

Her early ambition had been to enter journalism after graduating from Vassar in 1922. "But a job in astronomy was offered me and none in newspaper work," she recalled in explaining her coming to Harvard nine years ago.

Yet in an important paper she filed a report of an assignment any veteran journalist might well envy—the exploration of the so-called outside universes. She covered her assignment so well that she discovered nearly 3000 new galaxies in the constellations Coma and Virgo which form the proof of Dr. Shapley's theory of the translucency of the space beyond our universe, one of the two developments reported at the annual meeting of the American Association for the Advancement of Science in 1929. This work has brought Miss Ames world wide recognition, including election to the International Committee on Nebulae and Clusters.

As one of the first to chart the nebulae of outer space Miss Ames achieved distinction a lifetime of journalistic effort might have denied her.

Her responsibility as first assistant in the study of outside galaxies was one of the most important on the staff as well as one of the most fascinating in all astronomical research. It was stark pioneering in a field about 100 square degrees in area, a sample field upon which was based a similar survey of the whole sky.

"I collect only the facts. The theories are Dr. Shapley's," was the modest way in which she dismissed any reference to the reputation that came to her. "There is a very definite satisfaction in finding a thing you are looking for, if you are doing a thing that requires a great deal of measurement and after putting all the data together you find some sort of correlation," she remarked in describing her job of astronomical pioneering. "For constant thrill I'd hand it to journalism, but for lasting satisfaction give me astronomy!"

After a search for ten days Miss Ames' body was recovered Tuesday, July 5. The funeral was held on July 7 in Christ Church, Cambridge, and the interment was made in the National Cemetery at Arlington.

The Period-Luminosity Curves for the Long-Period Variable Stars of Classes R and N

Some of the Long-Period Variables of spectral Classes R and N are among the most interesting stars of the sky. The Class R stars include U Cygni and S Camelopardalis, while R Leporis, RV Centauri, and S Cephei, all of them favorites with observers of variable stars, are of Class N. Many more interesting members of these classes might be mentioned, but the reader is referred to Paul W. Merrill's article in the October, 1929, number of POPULAR ASTRONOMY for a catalog of these stars.

There is a possibility that with closer observation, one of these stars, U Hydrae, which is by some authorities classified as irregular, but which shows strong signs of a period of either 190-220 days or 80-100 days, may prove to be related to the RV Tauri variables. (Note: The star does show large irregularities. The writer's interpretation of the A.A.V.S.O. observations may be wrong.)

These stars are comparatively few in number, only 29 long-period variables of Class N and 5 of Class R being known. The proper motions are known for about twenty of them, but the difficulty in using these proper motions for the determination of the luminosities lies in the shortage of radial velocities. It is true that the standard solar motion, 20 km/sec, can be used, but to judge from the case of the Me long-period stars, such a result might be seriously incorrect. However, the pulsation theory of stellar variability and the mass-luminosity law permit the calculation of the luminosity of any pulsating variable star, whose period and surface temperature are known.

The purpose of this paper is to calculate the period-luminosity curves of the long-period variables of Classes R and N from the pulsation theory of stellar variability.

There are three theories as to the light variations of long-period variable stars. First, there is Eddington's theory that the light changes are due to the periodic outbursts of a continuously luminous star; that minimum light is the normal condition of the variable, and that the long-period variables are closely related to such stars as SS Cygni and U Geminorum. Secondly, there is the veil theory of Merrill, that the variation is due to the periodic accumulation of opaque clouds in the outer atmosphere of the star and their dispersal by the heat accumulated below. Thirdly, there is the pulsation theory, which relates the long-period variables to the Cepheids, and attributes the changes in luminosity to periodic changes in the diameter of the star.

The writer prefers to adopt the pulsation theory for the following reasons: First, the fact that the difference between the long-period variables and the Cepheids particularly those Cepheids with periods greater than thirty days, is slight compared with the difference between the long-period variables and the SS Cygni type. Secondly, a general similarity of light-curves between Cepheids and the more regular long-period variables. Thirdly, the Me stars at least among the long-period variables, follow the period-spectrum relation. Fourthly, some of the better observed long-period variable stars show variable radial velocity of the type observed in Cepheids. Fifthly, the long-period variables seem to link on to the RV Tauri variables. Lastly, the pulsation hypothesis permits the calculation of a theoretical luminosity curve, while the other two theories do not.

The following equations are the basis of the calculation of theoretical period-luminosity curves using the pulsation theory.

$$A = 7.2 - 3.75 \log (1 - B) - 3.5 \log M - 2 \log t. \quad (1)$$

$$A = 42.0 - 5 \log R - 10 \log t. \quad (2)$$

$$\text{Log } P = \log K - \tfrac{1}{2} \log d. \quad (3)$$

In these, A is the bolometric absolute magnitude; $(1 - B)$, the ratio of the radiation pressure to the total pressure inside the star; M, the mass; t, the effective surface temperature in degrees Centigrade Absolute; R, the radius; d, the mean density in terms of the sun; P, the period; and K, a constant, the natural period of free pulsation of the sun.

Equation (1) is Eddington's famous mass-luminosity relation, which expresses the fact that for all stars of the same model, as the writer assumes all long-period variables and all Cepheids of period longer than ten days to be, the luminosity is a function of M and t. Equation (2) gives the luminosity as a function of R and t. Equation (3) gives the period as a function of the mean density and therefore of R and M. It therefore follows, that if these equations rigorously hold, then, for a pulsating star of a given model, the mass and surface temperature of the star uniquely define both its period and its luminosity.

The effective temperatures, heat indices, and band absorption, of the subclasses of the "Carbon Sequence" containing the long-period variables are given in Table I.

TABLE I.

Effective Temperatures, Heat Indices, and Band Absorption of Long-Period Variable Stars of Classes R and N.

Spectral Subclass	R3	R8	N3	N8
Temperature	3300	2600	2300	2000
Heat Index	2.04	3.4	4.3	5.66
Band Absorption (Visual)	small	0.5	1.5	large and uncertain

These temperatures are based upon consideration of all material bearing on the subject that was available to the writer. For references, see Russell, Dugan, and Stewart, "Astronomy," and Miss Payne, "The Stars of High Luminosity." It will be seen that the heat indices cut off from two to six magnitudes in passing from the radiometric to the visual magnitudes.

The method used in computing the period-luminosity curves was that found in Shapley's "Star Clusters," page 142 and following. The standard star adopted was a Cepheid variable with a period of 47.1 days and a spectrum of class G7.5. For the physical properties of this star see page 146 of Shapley's "Star Clusters." Table II, below, gives the period-luminosity relation for spectral classes R3, R8, and N3, computed by the Shapley method, and corrected to visual magnitudes for heat index and band absorption. Owing to the very great uncertainty of band absorption in stars of Class N8, no period-luminosity relation was computed for these stars.

TABLE II.

The Period-Luminosity Relation for Visual Median Magnitude of Long-Period Variable Stars of Classes R and N.

Log Period	2.0	2.2	2.4	2.6	2.8	
Class R3	—4.6	—5.7	—6.8	—7.9	—9.5	Absolute
R8	.....	—2.7	—3.85	—4.9	—6.5	Visual
N3	.....	0.3	—1.2	—2.3	—3.4	Magnitudes

Perhaps the most sensational consequence of these results is the way in which RU Virginis takes the high luminosity championship away from S Doradus. At

maximum, if the writer's results are correct, this long-period variable has an absolute magnitude of —10.45, which is 1.55 magnitudes brighter than any observed maximum of S Doradus. And RU Virginis is at a disadvantage in the matter of temperature (S Doradus is of spectral class Beq). So apparently the mass of RU Virginis is comparable with that of *27* Canis Majoris.

The results for stars of N3 agree well with the absolute magnitudes from proper motions (see "The Stars of High Luminosity," page 187). The results for Class R8 seem to agree fairly well with the high luminosity spectra of U Cygni and S Camelopardalis. Probably the situation in Class R is similar to that which Stromberg found in Class K. Most of the R stars are about absolute magnitude 0, but there is a high luminosity branch extending up to —5, and composed in this case of long-period variables and R Coronae stars. At any rate, independently of the writer's results, a theory of this type is almost made necessary by spectroscopic data.

If the diameters of RU Virginis and S Aurigae be computed from their absolute magnitudes as read from the period-luminosity curves the stars come out larger than the orbit of Saturn. The diameter of RU Virginis comes out as 2,280,000,000 miles; and that of S Aurigae as 1,810,000,000. Both these stars are so large that if the sun were placed at the center of either, the planet Saturn would be within them.

One other fact that the writer would like to call the attention of the reader to is the large mass of the stars discussed in this paper, from 70 to 500 times that of the sun. Apparently a Class N long-period variable contains enough matter for a pretty good star cluster.

The writer is indebted to Leon Campbell of Harvard College Observatory and to Dr. Otto Struve of Yerkes Observatory for helpful criticism of this paper and for valuable suggestions concerning its revision.

Noah W. McLeod.

Christine, North Dakota.

Book Review

The Universe Unfolding, by Robert H. Baker. (The Williams and Wilkins Company, Baltimore, Maryland. $1.00.)

This is the second volume to appear in a series of twenty similar volumes which is promoted by the "Century of Progress" organization. The series is intended to put into permanent form the results of the progress made in various directions as they will be portrayed in a concrete way at the International Exposition in Chicago in 1933.

Although the title might suggest it, the book is not primarily concerned with the very recent concept of an expanding universe. It is rather concerned with a presentation of the steps by which man's ideas of the universe have unfolded from the naive view represented by the Ptolemaic theory, and even earlier, to the newest theories announced within the last year. A careful reading of this volume of 140 pages will put one in touch with a train of thought, extending over a period of more than twenty centuries, which is most fascinating and stimulating. The book is to be commended very highly for its clarity and its scope.